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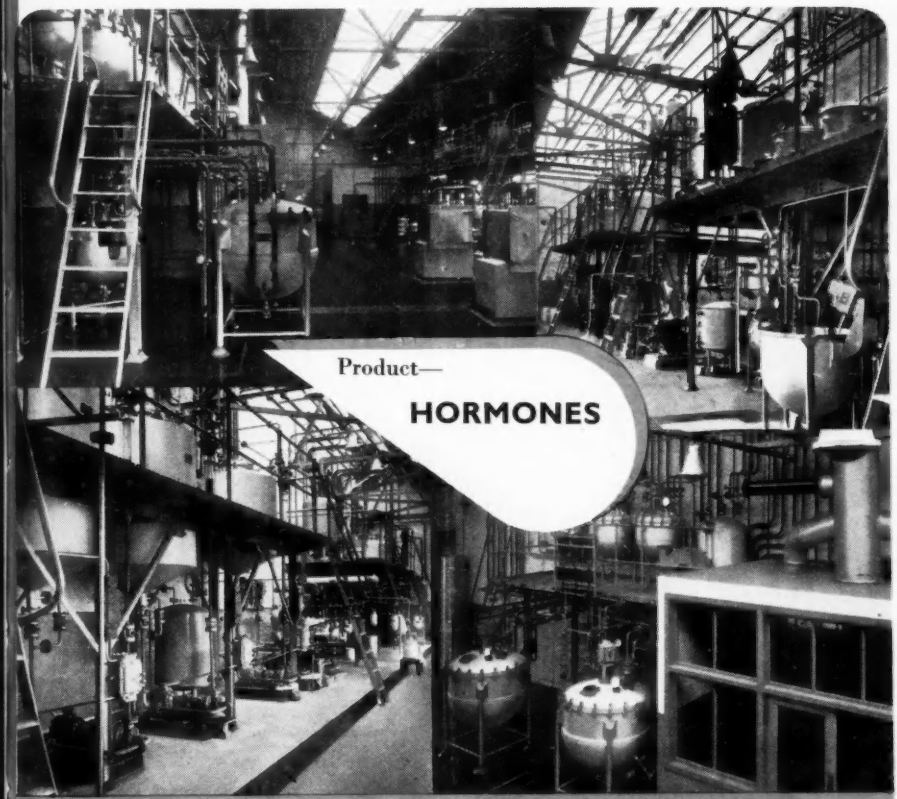

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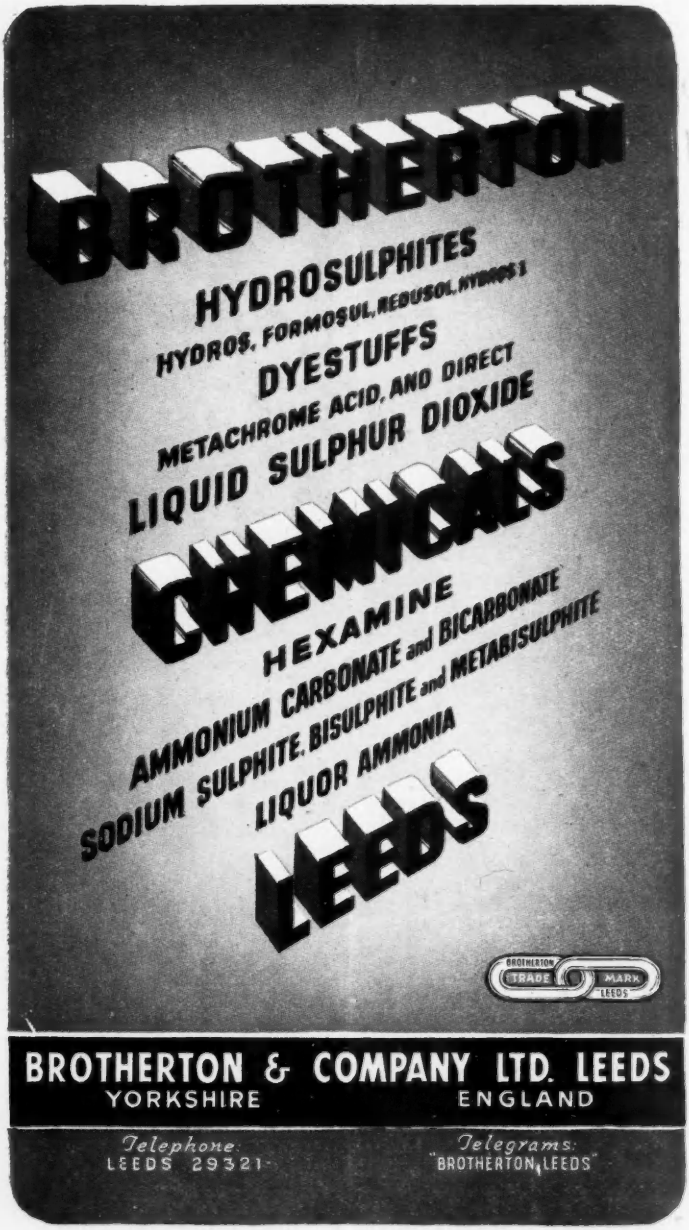
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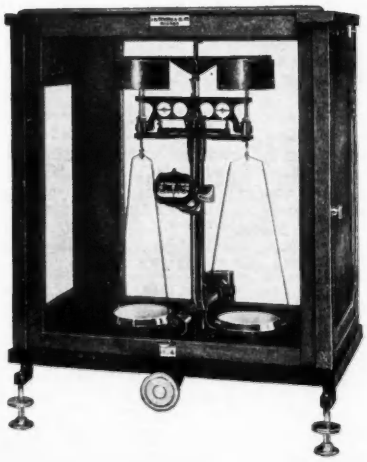

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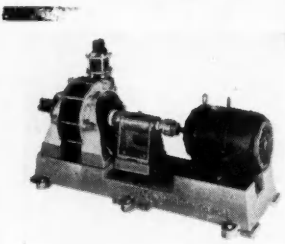

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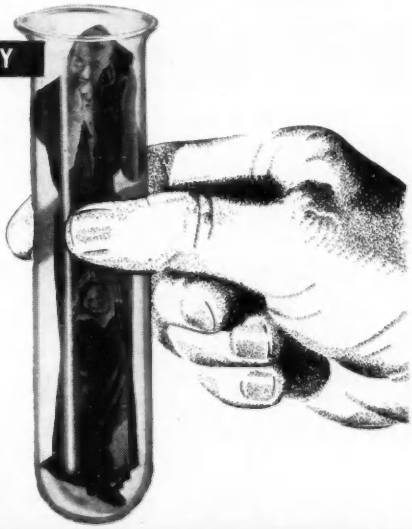

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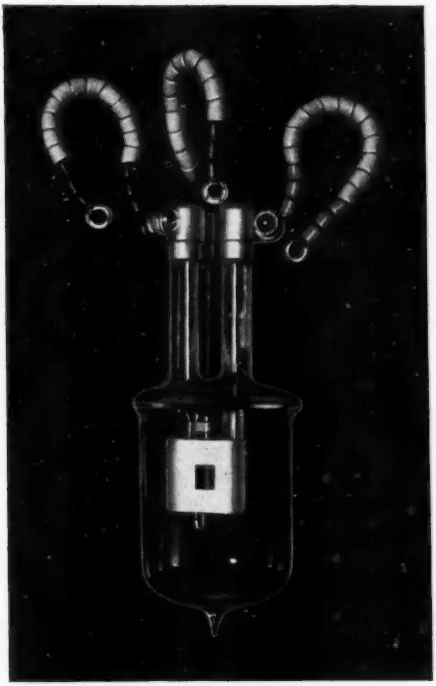

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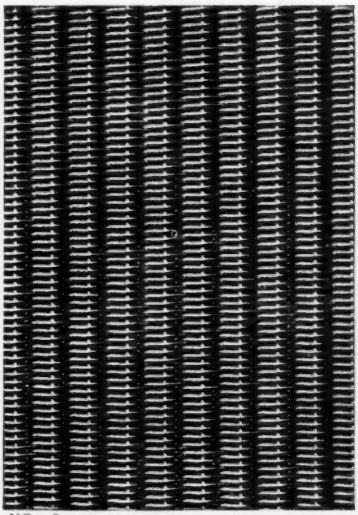

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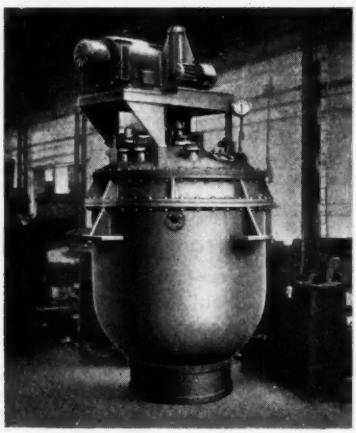

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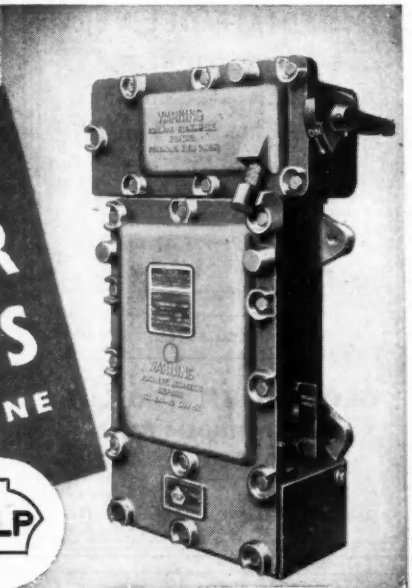

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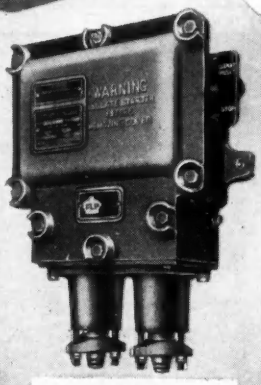

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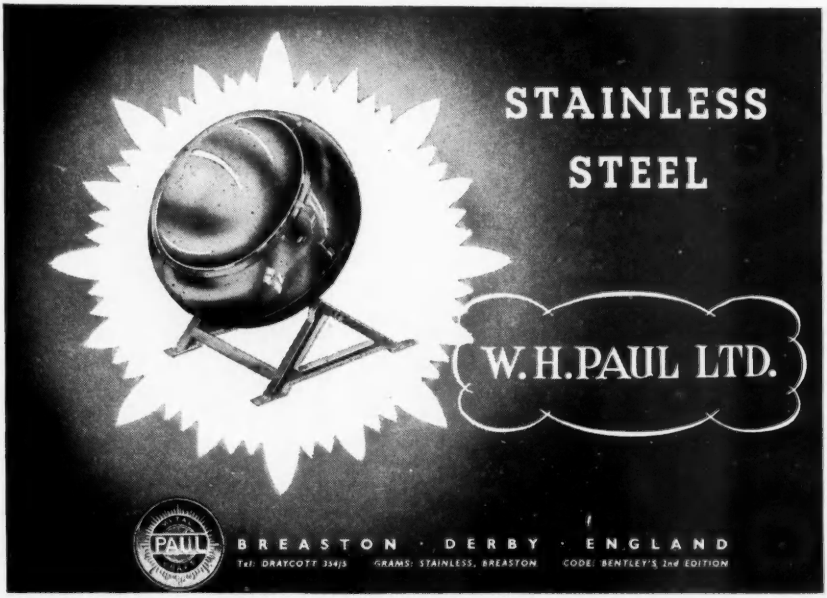

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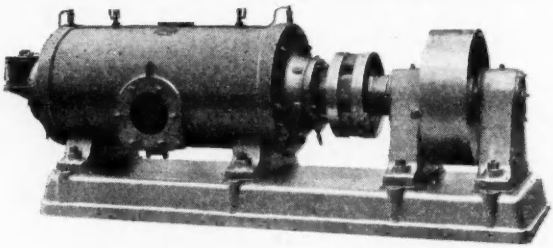

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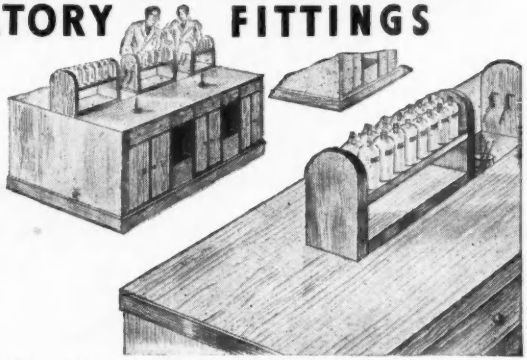

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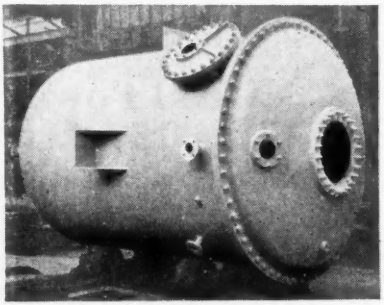

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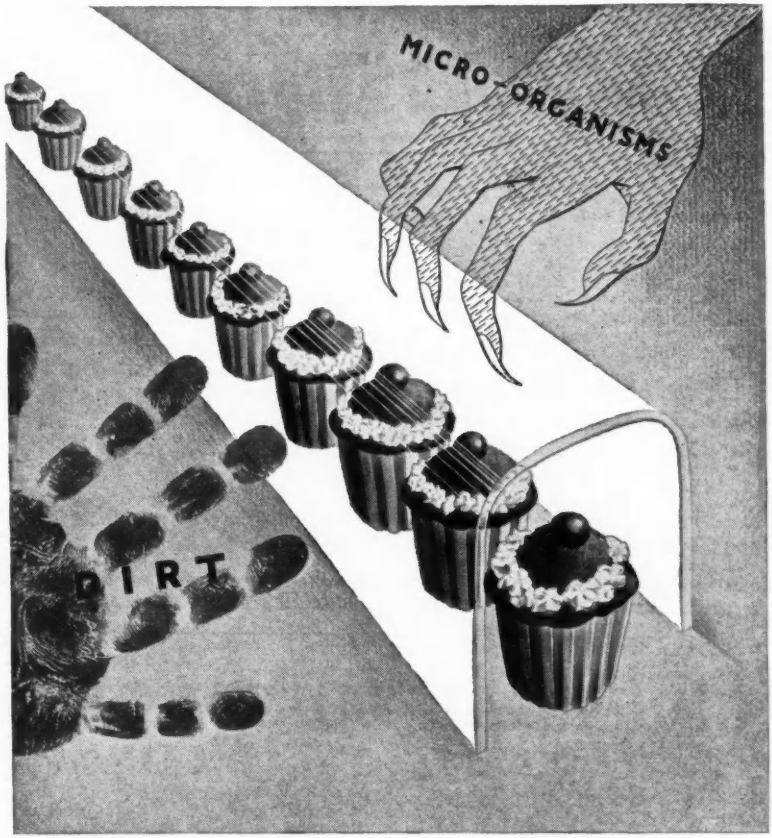

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Volume LXI | 30 July 1949 | Number 1568

Future of British Minerals

SELDOM has a Government-sponsored report representing the results of detailed and necessarily protracted inquiries made its appearance more opportunely than the Report of the Mineral Development Committee.* It will stand as one of the comparatively few redeeming features of Mr. Emanuel Shinwell's term of office as Minister of Fuel and Power that he was at least officially responsible for the appointment, in August, 1946, of the committee of 12, including mining experts, under the chairmanship of Lord Westwood, whose report on mineral resources and prospects in the United Kingdom now comes to hand—at a time when the likelihood of diminished purchases from overseas makes vitally important any evidence which can lead to enlargement of home supplies. While the report is more of a stocktaking document than a blueprint for new production, it has many constructive suggestions, which deserve an impartial hearing, uncoloured by the dislike that will inevitably be felt for one of its fundamental proposals—that the State should control the further exploitation of a wide group of mineral ores. That is suggested as one of the functions of a Mineral Development Commission, and the present Minister of Fuel has conferred official blessing on that proposal.

No fair judgment of this recommendation can be formed without taking account of the effect of the Town and Country Planning Acts, which have already deprived all owers of unexploited minerals of the right to benefit from their development. The deplorable result of that legislation has been to remove all incentive to new mineral development by private owners, from whom "development value" of land has been transferred to the Central Land Board. It is to be noted, however, that one of the committee, Mr. Peter Thornycroft, M.P., dissociated himself from the proposal to set up a commission.

At the time of its appointment and during much of the period in which the investigations were carried out, the committee could not foresee to what extremities we were to be driven in 1949 by the dissipation of hard currency. Had that been possible, the committee might have made its contribution somewhat more valuable by appending a more specialised study of the possibilities—limited though they may be—of substituting home produced minerals for some of those which we may soon be obliged to take on a considerably less liberal scale from the traditional foreign producers. The

* Report of the Mineral Development Committee, Cmd 7732 ; the Ministry of Fuel and Power.

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present report and the uncomfortable economic tidings with which it has more or less coincided do clearly indicate the need for an investigation on those lines by a full-scale commission, rather than a specialised committee such as this, whose limited terms of reference were formidable enough.

The committee had in mind something of this sort when it framed the recommendation which appears in the final summary: that there should be set up a Mineral Development Commission on lines similar to the Coal Commission, to work in close collaboration with the Geological Survey (DSIR). The corollary that the commission should acquire the ownership "of certain specified minerals" opens up highly unattractive posibilities, but other suggested functions, such as the promotion and co-ordination of research and the granting of financial aid to private mining, do tend to compensate for this further step towards centralisation.

The committee, disregarding "coal, oil, bedded ironstone and substances of widespread occurrence" (gravel, slate, etc.) has concentrated on tin, tungsten, lead, haematite iron and zinc ores and 14 non-metal deposits. The last, headed by barytes, barium brines, witherite and fluorspar, in that order, included china clay, ball clays, gypsum, anhydrite, salt, potash, fullers' earth, talc, serpentine and glass sand. Nearly all these minerals are of the utmost interest to chemical industries, and wherever the special committee has been able to point to possibilities of raising production totals it has performed a useful service for those industries. Having regard to the fact that mineral prospecting in the United Kingdom was old long before many of the better known producing areas were opened up, it is not to be expected that there are now easily unexplored deposits sufficiently large to change the supply position in short time.

The committee has possibly understated the prospects, but so far from discouraging potential mining developments, it has underscored in more than one section of the report the urgent need for new enterprises, and has also pointed to some of the factors which hindered growth in the past. The committee estimates, for example, that if the 1947 output is maintained, present deposits of tin and wolfram concentrates will be exhausted in less than ten years. On the same

(*continued on page* 140)

Notes and Comments

Export Cuts

THE disquieting evidence which June has yielded of some weakening in United Kingdom export trade has necessarily had its counterpart in the totals of heavy chemicals sold overseas. That there has been some setback in sales of industrial chemicals, and notably some which are regarded as basic from the standpoint of production here and of needs of foreign industry, is evident. One of the more conspicuous pointers in this connection is what has been happening in the widely used group of sodium chemicals. Sales of sodium carbonate, soda ash, etc., have dwindled from some 383,000 cwt. in June, 1948, to 299,000 in May this year, and last month had dropped steeply to 150,372 cwt. That item alone represents a fall of more than £200,000 in the monthly earnings in June in the two years. Caustic soda has experienced a rather less severe reduction, from some 203,000 cwt. a year ago to 157,998 cwt. last June, and a notable rally a month before to over 254,000 cwt. has helped to keep the long-term account on a rather steadier basis. Among the many factors which had contributed to this change in prospects for these traditionally large items in the chemical trading account the accumulation of surpluses in several parts of the world, not long released from conditions of acute scarcity, is fairly widespread: for example, in India, where severe buying cuts have been made. The evidence yielded in the current *Trade and Navigation Accounts* of the large help which British countries as a whole have given to uphold the sodium chemicals trading account might well be taken as a timely hint in framing future overseas trading policy. While the total yield of chemicals, disregarding drugs and dyestuffs, £3,665,357, was almost £1 million less than was realised in May, the result was, in fact, little over £200,000 less profitable than in June last year.

Coal Facts

GOOD news about coal is rare, so that the rather better tidings just given by Sir Arthur Street, deputy chairman of the National Coal Board, in Birmingham last week-end were imbued with scarcity value. He disclosed that in the first half of this year coal output topped 102 million tons, compared with 99.78 million tons at this time last year. Rather more promising were the facts he quoted to show that the gradual climb to better results was a long continued process still operating, although at a rather slackened rate. Compared with the low level record of 175 million tons of deep mined coal raised in 1945 and the subsequent 180, 186 and 197 million tons in 1946, 1947 and 1948, the present rate of output can readily be made to appear phenomenal—provided what was commonly raised before the current outlook on the function of coal mines is rigidly excluded from view.

Earnings and Output

FROM that modified standpoint, there are good grounds for relief in some of the points raised by Sir Arthur Street and amplified in this week's publication by the NCB, "Coal Figures." Output per manshift at the face has risen from 2.76 tons in 1946 to just three tons throughout the first half of this year, and there has been an even steeper rise in the first quarter of this year. It is no doubt ungracious to recall that miners were averaging three tons per shift in 1938. "Coal Figures"—which has nothing to say about coal prices—discloses that the average weekly earning, including 8s. allowances, of miners in the first quarter of the year was £8 18s. 7d.

Chemical Crop Protection

THE comparatively lukewarm interest shown by farmers in pest control products and their failure to make the best use of them, despite their influence on crop protection, was

the subject for comment by Lord Bledisloe when, as president, he recently opened the second International Crop Protection Congress in London. While the fruit-grower appreciates the value of pest control and weed killers are slightly more freely used, it seems that the farmer still retains much of his traditional conservative outlook on the newer chemical aids to husbandry. Market research by such organisations as Shell Chemicals' horticultural section, and the farm service of Shell-Mex confirms this, and although the various pest control products are already marketed at prices which make their use economically practicable, greater use and more co-operation by the farmers would almost certainly enable the cost to be further reduced.

Smokers' Cure ?

THE Americans have an engaging readiness to look at commonplace materials with a speculative eye. It is a commendable habit which in the persons of some of this country's early industrial chemists, produced returns of almost fabulous proportions. That result is perhaps not to be expected from current investigations in the Ohio State University, Columbus, of what goes to make up cigarette smoke. The quick answer here might well be " about 90 per cent Customs duty." The American workers, fortunately, are still able to take an unimpassioned view, and have determined that each average cigarette produces in burning two distinct smoke streams, that which is drawn through the cigarette and is predominantly acid in character, and the secondary stream emitted from the glowing end, which is alkaline. Smoking—mechanically—200 cigarettes in an 8-hour day, the U.S. workers have established that the average American cigarette provides the smoker with all these incidentals: 4.3 ml. carbon monoxide, 7.7 per cent by volume carbon dioxide, equivalent to 34 ml. per cigarette; hydrogen sulphide 0.0019 per cent by volume of gaseous phase. Hydrogen cyanide was not detected. Acetylene was found in the cigarette smoke and there were some other unsaturated hydrocarbons. Now we know why these chemical generators used to be called " gaspers."

FUTURE OF BRITISH MINERALS

(*continued from page* 138)

accounting basis, barytes, witherite, fluorspar and haematite iron ore might also be exhausted within 10 to 20 years if no supplementary supplies are added in that period. Salt, anhydrite and gypsum may serve for 50 years or so.

The assumption that we shall be content to go on living on our present mineral capital without taking any effectual steps to add to it is not seriously entertained, and there are several indications that the age of mineral discovery here is not nearly ended. Possibly the most encouraging factor in this connection is the considerable advances in mining technology and even greater development of equipment made since many of the older mineral workings were abandoned as being uneconomic. One is reminded of the great increase represented by the modern capacity for plumbing great depths and tapping soluble salts by pumping in the committee's revelations about what has been brought to light in recent times from the exploratory borehole sunk by the D'Arcy Exploration Co., Ltd., at Aislaby, near Whitby, in 1938. The outstanding fact is that from this borehole came evidence that potash lies there. This was the first proof that K_2O exists, in this case as about 45 ft. of polyhalite of 15.6 per cent potash content at about 4500 ft., interspersed with salt beds and potasium chloride.

It is scarcely likely that this will prove the last " windfall " that deep exploration is to yield, so that the obligation to press on with all similar work cannot be disregarded. There remains, however, the widespread conviction that these ends would be more directly approached by the expert mining groups and the Geological Survey without help from the Ministry of Fuel.

LEAD AND ZINC PRICES

Official Rates Raised Again

THE third revision within three weeks of lead and zinc prices, reflecting the intimate dependence of Ministry of Supply trading upon the American market, has been announced this week. Good soft pig lead is raised (per ton) by £1 7s. 6d. to £82 7s. 6d., and good ordinary brand zinc by £2 15s. to £63 10s.

These increases are evidently influenced by a fresh advance in U.S. prices. Lead in New York was, on July 25, raised by ½c. to 14½c. per lb. and zinc by ½c. to 10c. Similar increases have been made by the Consolidated Mining and Smelting Co. of Canada.

The recent Ministry of Supply price fluctuations (THE CHEMICAL AGE, *61*, 78 and 11) have been these:—

GOOD SOFT PIG LEAD

	New price £ s.	*Old price* £ s.
July 12	75 10	82 0
July 14	81 0	75 10

GOOD ORDINARY BRAND ZINC

	New price £ s.	*Old price* £ s.
July 12	58 0	78 0
July 19	60 15	58 0

THE 29th BIF

APPLICATIONS have already been received for more than half of the total space available at the 29th British Industries Fair at Earls Court and Olympia in London. (May 8 to 19, 1950.) In Birmingham, where a similar proportion has been received by the Chamber of Commerce, extensions are being made to the outdoor section.

In the London section over 800 exhibitors have applied for more than 300,000 sq. ft. out of a maximum of 555,000 available. Requests for space are being made in numbers similar to last year, but as the closing date for applications has been advanced by two weeks, to July 30, 1949, there may be a sharp increase in the waiting list of late applicants. By mid-August, nine months before the Fair, the organisers must assess the scale on which each industry will be represented.

At Birmingham, there is no fixed closing date and the rate of application is well up to last year. By conversion of 40,000 sq. ft. of car park, the available space will be increased to 450,000 sq. ft., making possible a special display of British contractors' plant.

LINSEED OIL SUBSTITUTE

Promising Research at Liverpool

SCIENTISTS at Liverpool University have succeeded in producing a substitute for linseed oil from the seed of a West African wild vine. Lord Hankey, chairman of the Colonial Products Research Council, described it in the House of Lords on July 19 as a very promising and valuable substitute. The botanical name of the wild vine is *tetracarpidium conophorum*, and the oil is called conophor oil. Before it can be determined whether the oil can be produced in bulk it has to be ascertained whether the wild vine will grow as a cultivated crop, and experiments on these lines are being made in Nigeria.

Prof. T. P. Hilditch, professor of industrial chemistry at Liverpool University—distinguished for his work on the chemistry of natural fats—has been working at the head of a small group of scientists in the university laboratory for the past six years on the seed of the wild vine. "It is two years since we reported that it might be useful," he said recently, "but progress is bound to be slowed down, because the vine takes two years to flower. It is not like flax which gives a yearly crop. I know that they are taking the job of cultivating the vine very seriously in Nigeria, and they are getting some interesting results. It might be ten years before the vine is really under full cultivation."

A Colonial Products Research Council report says says success depends upon the possibility of producing at least 10,000 tons of oil a year. The spasmodic production of a few tons or hundreds of tons of a drying oil would be of no permanent interest to the paint and varnish industry. Commercial tests have been undertaken by firms engaged in this industry and the linoleum industry. If available in quantity, conophor oil would be a very welcome addition to the world's supplies of drying oils.

Among members of the Liverpool University research team in the early experiments under Prof. Hilditch were Dr. F. D. Gunstone, who afterwards took up an appointment at Glasgow University, and Dr. J. P. Riley.

Higher Employment Rate

The unemployment figure for the month ended June 13 was 263,643, a drop of 40,522 from that of the previous month. This was the lowest figure for two years.

REDUCED CHEMICAL EXPORTS

June Total was £1 Million Less

CHEMICAL exports from the United Kingdom in June, with a total of £6,947,307, showed a decrease of £1,144,442 from the May figure of £8,091,749, and were £222,459 less than in June, 1948. Notable decreases from May totals include formic acid from 5641 cwt. to 1973 cwt.; salicylic acid from 173,534 lb. to 120,362 lb.; ammonium nitrate from 10,644 tons to 3883 tons; tar oil from 4,077,401 gal. to 1,129,355 gal.; nickel salts from 6214 cwt. to 3672 cwt.; salt from 23,479 tons to 15,321 tons; sodium carbonate from 299,649 cwt. to 150,372 cwt.; caustic soda from 254,561 cwt. to 157,998 cwt. The total figure for exports of paints, pigments and colours fell from 195,218 cwt. to 155,894 cwt.

CHEMICAL EXPORTS

	June 1949	June 1948
	Cwt.	Cwt.
Formic acid	1,973	3,751
	Lb.	Lb.
Salicyclic acid and salicylates	120,362	204,372
Value of all other sorts of acid	£92,827	£80,756
	Tons	Tons
Aluminium oxide	47	374
Sulphate of alumina	3,405	4,791
All other sorts of aluminium compounds	366	414
Ammonium sulphate	33,262	23,577
Ammonium nitrate	3883	2,129
All other sorts of ammonium compounds	1,193	1,591
	Cwt.	Cwt.
Bleaching powder	29,752	28,299
All other bleaching materials	9,711	12,178
	Gal.	Gal.
Cresylic acid	83,565	199,510
Tar oil, creosote oil, anthracene oil, etc.	1,129,355	2,949,045
Value of all other sorts of tar oil	£18,007	£25,980
	Cwt.	Cwt.
Collodion cotton	3,343	1,348
	Tons	Tons
Copper sulphate	4,988	1,982
	Cwt.	Cwt.
Disinfectants, insecticides, etc.	52,275	54,545
	Tons	Tons
Fertilisers	811	3,777
	Cwt.	Cwt.
Nickel salts	3,672	3,504
	Cwt.	Cwt.
Lead acetate, litharge, red lead, etc.	4,774	9,406
	Gal.	Gal.
Tetra-ethyl lead	86,586	117,521
	Tons	Tons
Magnesium compounds	597	1,049
	Gal.	Gal.
Methyl alcohol	4,438	1,244
	Cwt.	Cwt.
Potassium compounds	4,751	5,548
	Tons	Tons
Salt	15,321	18,616
	Cwt.	Cwt.
Sodium carbonate	150,372	383,354
Caustic soda	157,998	203,753
Sodium silicate	17,045	18,050
Sodium sulphate	65,725	79,675
All other sodium compounds	59,592	84,099
Cream of tartar	198	235
Tin oxide	495	571
	Tons	Tons
Zinc oxide	838	1,060
Total value of chemical manufactures, excluding drugs and dyestuffs	£3,665,357	£3,891,303
	Oz.	Oz.
Quinine and quinine salts	166,573	284,269
	Lb.	Lb.
Acetyl-salicyclic acid	135,286	55,885
	100	100
	International units	International units
Insulin	943,679	844,784
	Mega units	Mega units
Penicillin	683,863	334,006
Total value of drugs, medicines, and preparations	£1,676,732	£1,433,079
Total value of dyes and dyestuffs	£732,534	£751,305
	Cwt.	Cwt.
Plastic materials	33,344	29,474
Value	£426,268	£363,659
	Cwt.	Cwt.
Chemical glassware	1,008	1,828
Value	£44,575	£55,687
	Cwt.	Tons
Fans	3,342	128
Value	£104,353	£89,761
	Cwt.	Tons
Furnace plant	6,834	559
Value	£81,972	£66,344
	Cwt.	Tons
Gas and chemical machinery	18,950	808
Value	£214,319	£132,773

CHEMICAL IMPORTS

	June 1949	June 1948
	Cwt.	Cwt.
Acetic acid	5,744	18,985
Boric acid	11,440	6,852
All other sorts	3,537	5,938
Borax	18,200	27,645
Calcium carbide	—	23,005
Coal tar products (excluding benzol and cresylic acid)	—	14,237
Cobalt oxides	—	54
	Tons	Tons
Arsenic	160	—
Fertilisers	123	297
	Lb.	Lb.
Iodine	66,050	132,301
	Cwt.	Cwt.
Potassium chloride	1,021,250	963,988
Potassium sulphate	12,100	26,630
All other potassium compounds	3,166	5,602
Sodium nitrate	81,093	161,738
All other sodium compounds	2,283	5,664
Carbon blacks (from natural gas)	10,410	92,639
Total value of chemicals, drugs, dyes and colours	£2,161,126	£2,815,106

First British Potash Deposits

Report of the Mineral Development Committee

THE first connected account to the present time of the sequence of events related to the discovery in North Yorkshire, shortly before the war, of the only recorded potash deposits in England, is provided by the newly issued report of the Mineral Development Committee (this issue THE CHEMICAL AGE, page 137). The committee was set up by the Minister of Fuel (then Mr. E. Shinwell) in August, 1946.

The report recalls that in 1938-39 an exploratory borehole for oil was sunk by the D'Arcy Exploration Co., Ltd., at Aislaby, near Whitby. A detailed statement of the early information revealed by the borehole was given by Dr. G. M. Lees and Mr. A. H. Taitt (of the D'Arcy Exploration Co.) to the Geological Society of London on December 6, 1944, and published in the quarterly journal of that society in February, 1946.

Summarised, this statement notes that a salt bed was recorded at a depth of 3655-3680 ft., containing not more than 1 per cent potassium chloride (KCl), with a thin band of 3.2 per cent KCl at 3800 ft. A second salt bed from 3920-4193 ft. contained a thin bed of "sylvinite" with up to 34 per cent KCl. Further records of KCl were obtained immediately below this, but owing to incomplete core recovery, the exact thickness and quantity were unknown.

Deep Deposit

A third salt bed from 4312-4775 ft. contained a solid bed of polyhalite with 15.6 per cent potash (K_2O) about 45 ft. thick. Natural gas, about 95 per cent methane, under a pressure of 1650 lb. per sq. in., was struck at 4212 ft. A short test gave gas production at the rate of 2.5 million cu. ft. per day.

Near the base of the borehole at a depth of 4870 ft., water was encountered, the analysis of which showed 11,370. 1036 and 19.028 parts per hundred thousand sodium (Na), potassium (K) and chlorine (Cl) respectively. This represents almost a saturated solution of brine, containing, in addition, some KCl in solution. Owing to the collapse of the borehole, particularly at the salt horizons, the existing borehole could not be used for any further exploration or for longer pumping tests on the supply of natural gas and brine available.

Geological evidence from the borehole and the surrounding district suggests that salt beds of the type recorded are likely to occupy a considerable area extending mainly eastwards and not to be isolated, or fortuitous occurrences. Such deposits are stated to have been produced by the evaporation in Permian times of a sea, called the Zechstein Sea, long known to geologists as having once extended across North Germany to East Britain. Important deposits of similar salts which accumulated in the same area have been worked in Germany on a large scale for many years.

Two Potash Sources

It will be noted that the existence of two different potash salts has been recorded; sylvinite, containing KCl, and polyhalite, containing potassium sulphate. Of the two the former is by far the more important as a raw material for manufacturing fertilisers. Unfortunately, for technical reasons and because the boring was for oil, the recovery of the core from the borehole was incomplete in the salt horizons where KCl was recorded.

The attention of Imperial Chemical Industries, Ltd., was drawn by the D'Arcy Company to the salt deposits, which were not then known to contain potash salts, and they were invited to examine the borehole cores. The salts were found to consist chiefly of common salt (sodium chloride), anhydrite (calcium sulphate), sylvinite (mixed potassium and sodium chloride). Polyhalite (a hydrous sulphate of calcium, magnesium and potassium) was afterwards recognised to be present by Prof. W. G. Fearnsides and Prof. C. E. Tilley.

In Abeyance

No action was taken in regard to further exploration until 1948. Prior to that time, I.C.I., Ltd., which was already working anhydrite and salt further north in the Teeside area, did not consider the information then available justified further exploration from the commercial standpoint. However, in 1948 it drew the attention of the Ministry of Supply to the occurrence in view of a possible decision by that Ministry to undertake exploration as a wartime emergency measure.

This information was brought to the

attention of the Non-Ferrous Metallic Ores Committee (chairman, Sir William Larke, K.B.E.), which reported that the discovery was potentially important and recommended that if home-produced potash was required, immediate steps should be taken to ascertain the extent and thickness of the deposits by means of further exploratory boreholes. This report also recommended that the mineral rights covering the potash occurrences should be nationalised.

It was eventually decided not to proceed at that time, since it appeared that even should further boring give favourable results, the opening up of a mine at that depth to develop the deposits would be a long-term undertaking and costly in money and manpower. Other ways of working the occurrences, i.e., by pumping the brine at the base of the borehole, were apparently not considered.

Potential Value

In September, 1946, immediately after its appointment, the Mineral Development Committee thought the facts should be re-examined without delay in view of the potential importance of the discovery. I.C.I. kindly supplied the committee with further reports and I.C.I.'s attention was naturally centred on the possible value of the substantial deposit of polyhalite. That company's opinion at the time was that, while more information about the deposits was essential, and because further boreholes would be costly, the committee should arrange some preliminary research work on the value of polyhalite as a fertiliser and investigate the cost and practicability of mining it at about 4500 ft.

The existence of the methane gas under pressure immediately above the polyhalite would have added to the mining difficulties. From the commercial point of view, I.C.I. doubted whether, on the facts available, the project could compete with imported potash. The committee ascertained that, although research in America suggested that such mineral had some value as a fertiliser when untreated, it could not yet be stated that it would be worth winning from this depth, or that if it needed further chemical treatment the final product would not be too costly.

In December, 1947, after further discussion with Dr. G. M. Lees, Prof. S. E. Hollingworth and the Geological Survey at a special meeting decided that, subject to the results of further boring and pumping tests, a production of potash might be achieved more quickly and cheaply by pumping the brine solution which was proved at the base of the D'Arcy borehole.

Furthermore, it was realised that the recovery of potash by this means would involve also the separation of about 10 times the quantity of common salt, and that the economics of the project might be favourably influenced if the salt could also be used. There was also the possibility of natural gas, if it were found to exist in quantity, being utilised in connection with the pumping as a source of fuel in the extraction process, or being developed concurrently for other purposes.

Dr. A. Fleck, a director of I.C.I., later attended this meeting and his attention was drawn to the opinion the committee had reached. He admitted that up to that time I.C.I. had not thought that the extraction of potash from the deposits was a proposition which would justify commercial development by the company. After this meeting, however, I.C.I. examined the brine-pumping scheme and subsequently wrote to the committee (February, 1948) that it thought the project held sufficient promise to justify further exploratory boring; this it was prepared to undertake at its own expense.

In March, 1948, the committee communicated its provisional conclusions to the Minister, emphasising that on the face of it, the brine-pumping scheme was more attractive than mining polyhalite. The committee stated that the prospect of proving thicker beds of sylvinite must not be overlooked as this was potentially much more important.

I.C.I. Investigates

I.C.I. commenced one exploratory borehole later in 1948, with the main objective of investigating the potentialities of the potassium-bearing brine. By February, 1949, when this account was written, the borehole had been carried to a depth of 5300 ft., but it had not adequately penetrated the limestone strata in which the brine had been found in the earlier borehole, and technical limitation of the only equipment at present available prevented the borehole being carried to a greater depth. No further information about the prospects of the brine-pumping scheme, therefore, had yet been obtained.

This latest borehole, however, has yielded other information of great value. Precautions were taken to obtain cores of the strata in which the potash salts were recorded in the original borehole, and the committee understands that indications of a substantial thickness of potassium minerals were obtained which are promising enough to justify further exploratory work. Furthermore, it would appear that interest may again

turn to the possibility of recovering potassium chloride either by mining or by a solution method, rather than by pumping the deeper seated potassium-bearing brine.

Though the magnitude in a geological sense and the economic importance of this latest discovery have yet to be proved, and it may be as long as two years before sufficient additional exploration has been carried out, it looks as if the prospect is emerging of a most important addition to the country's natural reserves. As this is the first indication of the occurrence of a substantial quantity of a mineral highly valuable to agriculture, the whole of our domestic requirements of which are at present imported, great significance must be attached to this information, the report states.

If the most sanguine hopes of this project are realised and it is found that sufficient potash can be produced economically to make a substantial contribution to our domestic requirements, or even to make the U.K. self-supporting in this respect, then the question of whether one firm could or should embark on an undertaking of such national importance ought to be examined, adds the committee's report. Furthermore, the development of such a project, whether or not it be undertaken by more than one firm, should be properly planned and related to information about the extent and importance of the mineral occurrence as a whole.

In the meantime, now that more specific information is available about the extent of potash deposits, it is urgently necessary that further boreholes should be sunk, in order that the extent and economic value of the occurrence can be determined and the most suitable method of development in the national interest be ascertained. Until the proposed Mineral Development Commission is set up, the national interest in a project of this importance should be secured by some form of joint company with a controlling State interest, but in which other firms who might be interested in potash production in this country should be given the opportunity of participating under suitable arrangements.

The committee also recommends that, unless its proposals regarding the establishment of a Mineral Development Commission and the nationalisation of mineral rights are to be implemented within a short time, the mineral right in specified potash-bearing minerals shall be nationalised separately, and without delay, in the same manner in which petroleum mineral rights were nationalised under the Petroleum (Production) Act, 1934.

MINING CONGRESS ENDS

THE Fourth Empire Mining and Metallurgical Congress at its final session on Saturday (July 16) acclaimed the decision of the Empire Council of Mining and Metallurgical Institutions to accept the invitation of the Australian Government to hold the next congress in Australia in 1953. The offer of the Australasian Institute of Mining and Metallurgy to organise the meetings was also cordially accepted. The New Zealand Government has offered to share in making arrangements.

In winding up the proceedings, Sir Henry Tizard, president of the congress, proposed a vote of thanks to the University of Oxford, the Mayor and Mayoress of Oxford and all those companies and corporations and organising committees of the excursion centres whose generosity and hospitality had made the congress possible. A warm vote of thanks was also extended to the Institution of Mining Engineers and the Institution of Mining and Metallurgy; and to the organising secretary of the congress, Mr. F. G. C. Cutcliffe.

TITANIUM PROSPECTS

A NEW and cheaper process for extracting titanium from ore has been announced by Canadian experts of the Dominion Magnesium Company, Ltd., Renfrew, Ontario. Government experts have estimated that the world's largest supply of titanium is in Canada, at Allard Lake, Quebec, where deposits of the ore are said to total from 150-200 million tons.

The great ore deposit is 22 miles north of Havre St. Pierre, a port on the north shore of the Gulf of St. Lawrence, 570 miles below Montreal. A railway is already under construction from Havre St. Pierre, 27 miles to the ore body.

So far, U.S. undertakings, the Kennecott Copper Company and the New Jersey Zinc Company, have invested $25 million in the new metal. Their objective is to treat 2500 tons of ore a day. This will require the construction of an electric furnace, to be built at Sorel, Quebec. A contract has been let to the Shawinigan Water and Power Company for 150,000 h.p. to be made available by 1951.

Synthetic Detergents in France

Annual Production May Soon Reach 50,000 Tons

IN the many recent articles on the relatively new detergents, American progress has figured prominently. Probably less has been heard from other countries, doubtless for the simple reason that there has been less to record. France, however, appears to be an exception.

Although, in his comprehensive review of the subject, J. P. Sisley (*Oleagineux*, July, 1949, pp.405-413) had necessarily to devote considerable space to U.S. achievements, he brings France well into the picture.

Many Varieties

Production of synthetic detergents in France is expected to reach 50,000 tons by 1952, mostly alkyl sulphates and sulphonates. This compares with over 220,000 tons produced in U.S.A. in 1947, or about one-fifth of France's soap output. Beginning with the alkyl sulphates (sulphonated fatty alcohols), there are several made and sold in France, such as Sipons (Sinnova), Primatex (Francolor), Meliorans (Beycopal), etc. They are also the base of numerous washing preparations, *e.g.*, Solilaine, Percroix, Floss-Mousse, Agnèl, Bouclaine Blanche-Neige, and so on.

The sulphonated oxyethylamides of fatty acids are well known in France and also form the base of numerous specialities, including Sodapon T, Enerpon, Galloran, Solepals, Amitex TB, etc., and in washing preparations: Catox, Lavix, Mirabelle, Monolys, Orix.

Another group of comparable importance is that of the alkyl-arylsulphonates, including those with long straight paraffinic chains, for which Valtee has proposed the name liparylsulphonates. For products of the Nekal type, or condensates of a monomeric olefin, he has suggested the designation alcoyls or polyalcoylarylsulphonates.

The mono form of the latter has specially good softening qualities in either a hot or cold medium, as well as high stability. The poly compounds have similar properties, as well as marked degreasing powers. Owing, however, to their lack of molecular orientation their detergent properties are considered poor.

These relatively complex bodies are capable of innumerable modifications in structure and properties; and Sisley thinks that, in France, the problem of selection for specific purposes should be a matter of careful study since the automatic washing machine is still very little used in France. French examples of this class or of materials containing them are Sinnopons and Sivannons NSL, Ergagnols, Texaryl DS, Arylon, PAIC Agnel, Mir, Superlavix.

Among the alkyl sulphonates, those of Etab. Kuhlmann are fairly well known under the name of Ekasol D and Ekasol H, both in liquid form. But this class, though definitely of a detergent nature, is less efficient than those mentioned above. Of the secondary alkyl sulphates, Teepol is also well known in France, and among other things, forms a base for specialities used in the treatment or washing of woollens, *e.g.*, Bain-Mousse.

In the field of non-ionic products, *i.e.*, without active ions, there are three main groups: (a) non-dispersible, (b) dispersible, and (c) soluble. They were brought to the attention of French manufacturers by Sisley in 1943, in a paper read at the Centre de Perfect. Tech. de la Maison de Chimie. Another classification besides that based on behaviour with water is:—

1. Products obtained by auto-condensation of ethylene oxide, of which Polyglycol, Carbowax, and Emkapols are examples.
2. Products obtained by condensation of oils or fats or their derivatives with ethylene oxide. Examples include: derivatives of fatty acids (Edunine ON, Cémulsol, Emulsov; of fatty alcohols (Emulphor O); of aliphatic amides (Ethomids); and of aliphatic amines (Antarox E).
3. Products obtained by condensation of oxy-alkyl-aryl compounds with ethylene oxide, as exemplified by the well known Igepals, Triton, Sipon, etc.

Popular Form

Because of the absence of active ions, these products have no affinity for textile fibres, and their properties depend on length of the aliphatic chain and on the extent of oxy-ethylation. An important French product of this class is Léonil O (oleic alcohol condensed with 20 mol. of ethylene oxide), regarded as an excellent detergent for woollens; another variant is Léonil FFO, obtained by condensation of hexyl-heptyl-beta-naphthol with 8 mol. ethylene oxide.

(*continued on page 148*)

BUYERS' MARKET FOR GERMAN CHEMICALS

Export Agreements with France, Poland, Iran and Japan

INDUSTRIAL chemicals were one of the few industries in western Germany which further increased production during the month of June. Complete statistics for the first half of 1949 are expected to show substantial advances compared with the preceding year.

In May, production of sulphuric acid amounted to 78,200 tons (SO_3) against 48,100 tons in June, 1948; phosphatic fertilisers to 25,500 tons (P_2O_5) against 12,100 tons; dyestuffs to 1219 tons against 525 tons; soap to 6010 tons against 2371 tons; and washing agents to 15,000 tons against 10,600 tons.

Of special interest in view of the controversy concerning the dismantling of coal-oil plants are the statistics for the Fischer-Tropsch plants. These produced 4879 tons of primary products in May, 1775 tons of synthetic petrol, 573 tons of paraffin "gatsch," and 133 tons of hard paraffin.

Several more of the trade agreements which expired at the middle of this year have been extended for a period of 12 months, including those with France and Denmark. Chemicals are figuring prominently among the goods which western Germany has undertaken to supply. An agreement concluded with Poland provides for exports of $4.6 million worth of chemicals from western Germany. Finland is to receive $800,000 worth of west German chemicals and colours, Portugal $1.5 million worth of chemical and allied products, and Iran $1.8 worth of chemicals, paints, etc. Paints, dyes, and chemical fertilisers also account for a substantial part of the $10 million allocation of goods for Japan.

Russian Aims

The trade negotiations with the Soviet occupation zone of Germany are making very slow progress, and an agreement is by no means certain yet, but the Soviet zone authorities have stated that they wish to spend Dm.12 million on chemical products from western Germany. The eastern zone has at the same time presented a list of goods which are available for dispatch to the West, including chemical products amounting to Dm.5.85 million.

The renewal of trade agreements, in some cases providing for greatly increased shipments, has been noted with considerable interest by German chemical manufacturers, because marketing difficulties have arisen in several sectors of the industry during recent months. While seasonal factors may be largely responsible for the fact that a substantial part of the nitrogen fertiliser production—up to 60 per cent—has to be put into store, this explanation cannot be offered for the slow sale of soda ash and caustic soda, already reflected in declining outputs.

The decline in alcohol production during May is attributed to the high prices, which are said to have adversely affected the export prospects for organic products made from alcohol. Dyestuffs makers also report marketing difficulties, but sales of pharmaceutical preparations are said to exceed the level usual at this time of the year.

Soap Industry Problems

The German authorities have been urging the abolition of soap rationing on the grounds that the production of soap and detergents has lately been increasing rapidly and actual demand can at present be satisfied completely. Largely as a result of high prices, however, consumption has fallen substantially below pre-war levels and the standard in comparable European countries. As the most recent purchases of vegetable oils were made at lower prices, price reductions are expected, and consumption may be expected to improve.

It is still argued, however, that dismantling of all Fischer-Tropsch plants would deprive the soap industry of a useful source of raw materials, especially for washing powders, which would increase the demand for natural fatty acids by 40,000 tons a year. During the second half of 1949 between 24,000 and 28,000 tons of fatty acid are to be made available for the manufacture of soap, including 18,000 tons from imports. Better supplies of essential oils and other soap-making materials are also expected.

The Dortmund Chamber of Industry and Commerce has drawn up a memorandum on the dismantling of Fischer-Tropsch plants in which arguments used earlier are repeated. It is claimed that these plants would prove of particular advantage if and when sales of coal declined. The Fischer-Tropsch plants could use inferior coke which was not suitable for metallurgical purposes.

The products obtained had three and

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a quarter times the value of the coke and gas used, and the plants could therefore help to raise the potential profits of the coal mining industry, while at the same time ensuring additional employment for the Ruhr region.

In the aluminium industry dismantling operations began last week in the Erftwerk Grevenbroich, and the aluminium works at Töging, Bavaria, have received an order for partial dismantling. Both plants are owned by Vereinigte Aluminium-Werke, AG, whose combined output capacity exceeds the 85,000 tons a year maximum allowed to the western zones. German quarters, however, argue that after the dismantling at Grevenbroich and Töging the permitted maximum output will not be attainable, and that in any case 85,000 tons a year is less than the requirements of the western zones.

Pharmacy Exports

The well-known Schering pharmaceutical factory in Berlin has been forced to dismiss 250 of 1600 employees and to introduce a 36 hour-week as a "rationalisation" measure. Some of the departments moved to western Germany before the end of the war are now to be brought back to Berlin, but manufacturing activities will continue in a branch factory at Brunswick-Wolfenbuettel. The export business is described as satisfactory, especially to Turkey and Egypt, and also to Switzerland, Spain, Portugal and Siam.

Bakelite, GmbH, has opened production facilities in the works of Chemische Fabrik Weyl at Munich-Pasing to make up for the loss of its works in the Soviet zone and is once again producing phenolic resins for the paper and fibre-board industries. It is also making lacquer materials, resins for the manufacture of brushes, and raw materials for the plastics industry.

Ruhr Dismantling

DISMANTLING of further synthetic oil plant was scheduled to begin in the Ruhr this week.

The machinery to be removed is not in production and forms part of the plant of the Merbeck chemical works of the Rheinpreussen mining company at Moers, near Duisburg.

Coke ovens and machinery for producing a number of chemical by-products will not be affected, and the maintenance staff, who numbered about 100, are expected to be found other employment.

ITALIAN STEEL INDUSTRY

Modernisation under ECA

FIVE projects to modernise the Italian iron and steel industry, involving $9 million in ECA assistance funds, as part of Italy's four-year programme have been approved by the ECA in Washington. Most of the equipment for modernising Italian plants will be purchased in the U.S.A. It is indicated that a production level in the iron and steel industry equivalent to 2.5 million tons of crude steel per year is a rational basis for current planning.

The projects approved in Washington were:—

1. Equipment for modernisation of steel works of Acciaierie e Ferriere Lombardy Falck at Milan—$2.2 million in ECA funds and 1.7 billion lire.
2. Cold rolling mill for tin plate for Cantieri Metallurgici Italiani at Castellammare di Stabia—$1.96 million in ECA funds and 287.5 million lire.
3. Slab and billet mill for special steels for Cogne SPA in the Aosta Valley—$1.03 million in ECA funds and 273 million lire.
4. Continuous wire rod mill and bolt and nut equipment for SISMA at Villadesse—$2.45 million in ECA funds and 1.6 billion lire.
5. Slab and billet mill for I.L.S.S.A.—Viola at Pont St. Martin, Aosta Valley—$1.46 million in ECA funds and 800 million lire.

SYNTHETIC DETERGENTS IN FRANCE

(Continued from page 146)

This class of product, first prepared in Germany in 1932, is now made in France, England, America, and Belgium. The author has noted no less than 150 trade names belonging to 35 different firms. Production in the U.S.A. in 1946 was 900 tons, but this output is now exceeded by one firm alone. A limiting factor appears to be provision of ethylene oxide.

The author devotes most of the remainder of his review to the action of detergents, including synergic effects, with particular reference to recent American work in this field.

He has for many years urged upon the French chemical industry the importance of synthetic detergents and related products, emphasising at the same time that they are not merely soap substitutes. The French manufacturers are advised to exercise scrupulous care and chemical control in selection or production of raw materials, and to maintain quality.

NEW USES OF LEVULINIC ACID

Sugar Derivative as a Plastics Material

From A SPECIAL CORRESPONDENT

IN its search for new raw materials the plastics industry is showing an increasing interest in levulinic acid, which is now being manufactured in commercial quantities from sugar. This ketone acid is a crystalline solid; its specific gravity is 1.140 (20°C.); melting point 33.5°C.; boiling point 246°C., and it dissolves readily in water, alcohol or ether.

Levulinic acid forms salts and esters normally, its esters being of particular interest for use as plasticisers and solvents, *e.g.*, the methyl isopropyl, isoamyl and methyl propyl carbinol esters.

Many laboratory methods are available for the synthesis of levulinic acid, the simplest being to heat a hexose sugar, or a carbohydrate capable of being hydrolysed to a hexose sugar, in an aqueous solution with a mineral acid. Thus from sucrose, dextrose and levulose the catalytic action of dilute sulphuric and hydrochloric brings about the following change:

$$C_6H_{12}O_6 \rightarrow CH_3COCH_2CH_2CO_2H + CO + H_2O$$

Hydrobromic acid is much more effective as a catalyst than either hydrochloric or sulphuric acid and 10 per cent hydrobromic acid, when heated for 24 hours at 130°C. with dry glucose, will give a yield of 75.3 per cent of the theoretical amount of levulinic acid. In 1944 a British patent taken out by Haworth J. Wiggins (No. 583,533), disclosed that in the preparation of levulinic acid from sucrose a low concentration of sodium bromide could be used with hydrochloric acid to replace the expensive hydrobromic acid, and that by increasing the temperature and reducing the strength of the sucrose solution a considerable increase in the yield of levulinic acid could be obtained.

Research on Derivatives

A great deal of work on the derivatives of levulinic acid was carried out in America in 1930-33 under a multiple fellowship of the Sugar Institute, Inc., and the Mellon Institute of Industrial Research. The alkyl esters described by G. J. Cox and M. L. Dodds (*J. Amer. Chem. Soc.*, *55*, 3391 (1933) and *Ind. Eng. Chem.* *25*, 967 (1933)) are of considerable interest on account of their mutual solubility with water, stability of the esters in water, solubility of gums and resins in the esters and their miscibility with organic solvents.

The butyl and amyl esters appear to be the most immediately useful of the alkyl esters and, when these become available in commercial quantities, it is expected that they will find their most important outlets in the manufacture of resin-based lacquers for coating purposes.

Plasticisers prepared from levulinic acid are claimed to be effective for thermoplastic resins and synthetic rubber. The Dow Chemical Company took out a patent in 1944 (U.S. Pat. 2,359,622) for the esterification of a bisphenol to form 2, 2-bis (4=β-levulinyloxyethoxphenyl) propane, which offers promise as a plasticiser.

Plasticiser Characteristics

The Resinous Products and Chemical Company (U.S. Pat. 2,395,452) disclosed the preparation of the levulinate of hydroxy - dehydronordi - cyclopentadiene wnich is claimed to possess useful plasticiser characteristics; and Commercial Solvents Corporation (U.S. Pat. 2,406,504) has published a method of preparing Cyclic Ketol Compounds by treating an alkyl levulinate with 2-nitro-1,3-propanediol in the presence of an acid catalyst. The Pittsburg Plate Glass Company (U.S. Pat. 2,407,413) has patented the use of methyl levulinate as a plasticiser for styrene-maleic anhydride resin and claims that it possesses outstanding merit.

Although initial experiments in the production of levulinic plastics have not been entirely successful (the Hawaiian Sugar Planters' Association reported adversely on such resins as compared with commercial synthetic resins), there is evidence that derivatives of levulinic acid may be of importance in certain specialised fields. In a du Pont patent (U.S. Pat. 2,191,897, 1940) a water soluble levulinic acid addition product of ethanolamine is described as a softener for a flexible durable sensitive cellulosic structure. The Wingfoot Corporation (British Pat. 569,407, 1945) has discovered a method of making a levulinic plastic by co-polymerising a compound, such as dichloroallyl levulinate with a conjugated butadiene. The result is a thermoplastic possessing some interesting properties.

STUDYING SURFACE TEXTURES

Simple Plastic Reproductions and Light Tests

DEVELOPING a replica procedure originated for tests of machined metal, J. C. Richmond, of the Enamelled Metals Laboratory, and A. C. Francisco, research associate of the Porcelain Enamel Institute, at the U.S. Bureau of Standards, have developed a plastic-replica technique by which the texture of porcelain enamel may be conveniently studied and compared.

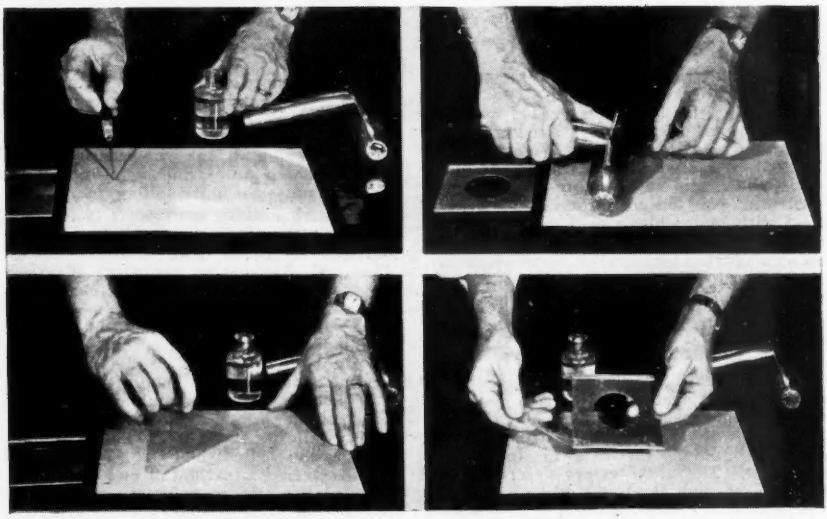
Evaluation is based on the measurement of the haze of an ethyl cellulose replica of the enamel. Such replicas may be readily examined by transmitted or reflected light, or can be projected for examination of the enlarged image. Details seen only with difficulty in the original surface are readily visible in the replica, which is a true reproduction of the surface texture.

Another advantage of the new method is that the replica forms a permanent record for reference. By making a series of replicas during an endurance test an investigator may follow the progressive breakdown of an enamel or metal surface.

Measurement of surface texture would aid in gauging surface defects as they occur in the plant. Moreover, a simple quantitative method for measuring this property of enamels should find wide use not only in the plant, but also in the laboratory and in field tests.

Laboratory tests for resistance to abrasion and attack by acids or alkalis are usually designed to reproduce under controlled conditions the mechanisms that damage the enamel in service. Therefore, quantitative measurements of surface texture should be valuable for evaluating and correlating the results of laboratory tests with performance in service.

Plastic replicas of porcelain enamel surfaces are prepared by a procedure similar to that used for replicas of machined metal surfaces. A solution is prepared by dissolving 1 g. of ethyl cellulose in 100 ml. of a solvent composed of 80 parts toluene to 20 parts acetone, by volume. A small amount of this solution is placed near one edge of the test area and is spread and pressed on the surface of the specimen under a 4-in. square sheet of ethyl cellulose (0.0075 in. thick) with a rubber roller.



The four steps in producing the plastic replica of a porcelain enamel. An ethyl cellulose solution is spread (top left) pressed under a plastic film, to which it adheres when dry. It can then be stored in a holder

After drying for a few minutes, the replica can be easily stripped from the surface. There is a tendency for it to curl on further drying, so that it is usually placed in a metal holder immediately after stripping.

As a part of the bureau's investigation, specimens of 25 enamels, submitted by the Porcelain Enamel Institute as representing a wide range of abrasion resistance, were given the standard (1942) PEI surface abrasion test. This test is based on the measurement of the loss in 45° specular gloss of the specimens produced by a standard surface abrasion treatment. Replicas from the abraded specimens were then rated by means of haze measurements, that is, the amount of light diffusely transmitted by a specimen, expressed as a percentage of the total transmission.

Close Agreement

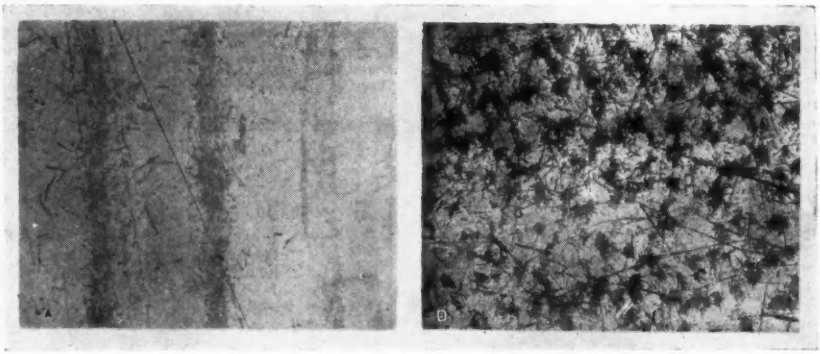
Comparison of the different methods of rating 25 enamels revealed that there was excellent agreement between the ratings of replicas as obtained by visual estimates and by haze measurements. Ratings of the specimens by the PEI loss-of-gloss method agreed fairly well with ratings by visual estimates made on the specimens and with haze measurements made on replicas, taken from the specimens.

Perfect agreement would not be expected in these cases, since different but related properties are being evaluated. Poorer agreement was obtained between ratings by haze measurements on replicas and by visual estimates on the various specimens.

The replica technique should find application wherever small-scale surface roughness is evaluated. It can be used to classify surfaces as mat, semi-mat or glossy, or to evaluate the degree of roughness developed in application of the enamel.

Computing irregularities in the replica in haze meter, based on two readings of light transmission

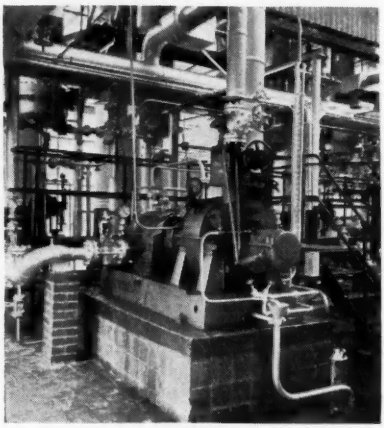
Replicas made in the field can be examined by the investigator at his convenience, or sent to a central laboratory for study. A series of replicas of the same area of a test item, made before installation and after successive periods of service, will permit a study of the progressive breakdown of a surface.



Two characteristic replicas showing (left) wear effect, principally on the peaks of a corrugated enamel surface, and (right)the widely distributed damage sustained by an "orange peeled" plain enamel

PUMPS FOR THE NEW OIL REFINERIES

Some of the Chemical Engineering Problems



One of the reactor pumps at Stanlow handling a mixture of hydrocarbon and acid

PROMINENT among the chemical engineering problems involved in the huge oil refinery and chemicals-from-oil plants now being constructed or put into operation in several parts of the country, is the installation of pumps. The circulating of the chemical liquids, required in the new plant of the Shell Chemical Manufacturing Co., Ltd., at Stanlow, near Ellesmere Port (THE CHEMICAL AGE, *61*, 45-47), from one section to another, and through stills, tanks, columns and heat exchangers, has called for a great variety of pumping equipment, some of special design.

These consist of well over 250 centrifugal pumps, covering the majority of all pumping conditions in the new plant, and are by Sigmund Pumps, Ltd., which has been responsible for this equipment. It is stated that some of the liquids are extremely volatile, others toxic; many are pumped at high temperatures (some above 600° F.); and again some are expensive, costing in some cases over 10s. per gallon. All kinds of liquids, from propanes and butanes to viscose fuels, have to be dealt with. These conditions demand extreme reliability of the pumps throughout, but especially of the shaft sealing member, in order to reduce leakage to an absolute minimum.

The large number of pumps involved created a considerable maintenance problem, as it seemed quite out of proportion to have a spare pump available for each duty, as is often done in refineries. To deal with all these aspects, all the duties to be performed were tabulated and then grouped. Thus, three basic pump designs were selected: a single-stage pump, a two-stage pump and a multi-stage barrel pump. Within these groups steps were taken to keep variations of parts to a minimum by employing the same internal parts in all three groups, *i.e.*, all employing the same impellers and wear rings, and between single and two-stage pumps only one bearing assembly is used.

Thus, about half of the total number of pumps supplied use the same wear rings, shaft sleeves and other wearing parts in single, two-stage and multi-stage units, and even in some vertical sump pumps. There are only two sizes of impellers used in these pumps, differing only in width, thus leaving all other components similar. A second batch of about 80 pumps uses another size of impeller and relevant components, one bearing assembly only being used for this group.

Facilitating Maintenance

Over three-quarters of all the pumps have only two sizes of bearing assemblies in single and two-stage pumps, the inevitable problems of maintenance during operation being much facilitated by this method and the work of storekeeping reduced to a few items only, which not only simplifies maintenance but also reduces considerably the outlay for spare parts.

Most of the pumps employ diffusers in either a ring casing or a volute casing. This has, in the case of ring casings, simplified the positioning of pump branches, the intakes being either horizontal, left or right, with outlets opposite, or top-top in an otherwise similar casing and similar direction of rotation.

Apart from this consideration, however, diffusers were chosen for another important reason. As is well known, simple volute type pumps have a heavy radial thrust, set up by pressure conditions in the volute against the shaft. This

tends not only to deflect the shaft in one direction, but also to create various states of deflection and vibration when controlling pump outputs during operation, which is done automatically by appropriate instrumentation.

The result of this unsteadiness of the shafts is quick wear of packings and shaft sleeves and difficulty in controlling leakage. Diffusers eliminate largely any radial thrust against the shaft and thus tend to reduce leakage to an unavoidable minimum. A leakage of one gallon per hour, when the price of the liquid is 10s. per gallon, would constitute a loss of £12 per day, a loss which is in almost all cases total, because most of the liquids evaporate on getting into the atmosphere. Provision is made for inserting Sigmund mechanical seals without any further modification, and after first using soft packing with appropriate and, in some cases, rather elaborate sealing systems, mechanical seals are now being installed for the more onerous duties.

Useful Design Feature

As a further means of reducing gland leakage, all stuffing boxes are kept under suction pressure only, this being accomplished by having the pump intake at the stuffing box end. This design feature has the further advantage of washing solids, such as crystals or grit, away from the stuffing box, instead of against it, as is the case with the more orthodox pump design. A cooling chamber surrounding the suction improves suction flow conditions on volatile and/or hot liquids.

A reactor pump deals with an onerous sludge consisting of light hydrocarbon and acid. The suction inlet at the stuffing box end is a typical feature of this. A special sealing system was thought necessary with injection and throttle clearances, to keep the amount of sealing liquid used to a minimum.

Internal Bearings

The liquid used for sealing is concentrated sulphuric acid, and stuffing box parts, as well as bedplates, are lead lined. Due to the length of the overhung shaft portion thus required, it was found necessary to incorporate an internal bearing. This could be done in this instance because the acid pumped, though extremely corrosive, is a good lubricant. Special materials are used throughout for this pump and the shaft-protecting sleeves and bearing bushes are faced with Colmonoy No. 6, an extremely hard and corrosion-resisting material.

For a considerable number of duties, where light hydrocarbons are pumped at high temperatures and pressures, barrel pumps were supplied with from three to eight stages. In these, only two joints are used, one of which is under high pressure, so that the danger of leakages from a multitude of vertical casing joints is reduced to a minimum.

A battery of centrifugal pumps, of which more than 250 are required for lifting and circulating the varied liquid materials employed by the processes at Stanlow

Growing Chemical Yield from Petroleum

Scope of U.S. Expansion Described at French Congress

A WIDE-RANGING survey of the recent advances and prospects for the use of petroleum as a raw material of the chemical industry was the principal item in the programme of the Association of French Petroleum Technicians —AFTP—during its traditional "Technical Week," which was held in Paris recently, the fourth of its kind since its inauguration in 1938.

A number of summaries of the many informative addresses delivered by leading authorities in their various spheres at this meeting have been reproduced this month by the *Petroleum Press Service*.

Chemical Derivatives

The phenomenal growth of the output of chemicals from petroleum in the U.S.A. was illustrated by some striking statistics submitted by Mr. E. V. Murphree (president of the Standard Oil Development Company), who dwelt mainly upon synthetic rubbers, plastics and fibres.

U.S. production of organic chemicals from petroleum or natural gas has risen from less than 100 tons in 1925, to a rate approaching 2 million tons a year. This compares with 1.5 million tons in 1945, the last year of the war. The combined output of formaldehyde, acetic anhydride, styrene, phenol and phthalic anhydride—all derived from hydrocarbons—amounted to 1 million tons in 1948, compared with 200,000 tons 10 years ago.

Synthetic rubber, the large scale production of which dates from the war, has obviously come to stay in the U.S.A., where more than 400,000 tons were used last year, compared with a natural rubber consumption of slightly over 600,000 tons. The great bulk of the U.S. synthetic rubber output consists of Buna-S, but the annual demand figure also includes about 60,000 tons of butyl rubber, 33,000 tons of Neoprene, and 6000 tons of Buna-A.

A large proportion of the supply of plastics and resins, which has jumped from 100,000 tons in 1939 to 660,000 tons in 1948, is now derived from vinyls and polystyrene, instead of the cellulose used almost exclusively 10 years ago.

America's production of rayon last year was approximately 500,000 tons, of which, however, only about one-third consisted of truly synthetic materials. This portion was obtained from cellulose and acetic anhydride, the latter having been derived chiefly from petroleum.

Other synthetic fibres, including, in particular, nylon, amounted last year to less than 10 per cent of the volume of rayon produced in the U.S.A., but some of these can be expected in future to play an increasingly important part in the textile field, said Mr. Murphree.

The production of synthetic detergents in the U.S.A. was discussed by Mr H. E. Bramston-Cook, general manager, Oronite Chemical Co. (Standard Oil of California), who showed what a considerable rôle these are already playing in U.S. consumption and how rapidly their use is increasing. He disclosed that U.S. sales of soap had dropped from 791 million lb. during the fourth quarter of 1947 to 545 million lb. in the corresponding three months of 1948, but that sales of package detergents had risen in 1948 from 60 million lb. in the first quarter to 120 million lb. in the last quarter. Industrial uses of synthetic detergents, not included in these figures, were, he said, estimated at 200 million lb. in 1948.

Biological Applications

The subject of the biological application of petroleum products was dealt with by Mr. G. H. Visser, director of research, Royal Dutch Shell Laboratory, Amsterdam. Certain petroleum fractions and petroleum-based chemicals, he said, were capable of exerting a pronounced influence on the physiological functions of some animals and plants.

Scottish Interest in U.S. Industries

WITH the object of extending Scotland's range of industries, particularly those based in scientific discovery, Sir Steven Bilsland, chairman of the Scottish Council (Development and Industry), and Dr. Christopher Macrae, secretary, will devote part of their visit to the United States in October to American firms who might be persuaded to establish plant in this country.

The council is examining, in association with British firms, the possibility of development in various branches of the chemical industry. The chemicals subcommittee has appointed a small group of experts to assess the needs of the plastics industry.

ADVANCED AMERICAN INSTRUMENTS

A Review of Some Recent Developments

From OUR NEW YORK CORRESPONDENT

A WIDE variety of new laboratory instruments has been developed and announced in the U.S.A. during recent months. These range from new instruments to detect atomic energy radiations to a new vacuum-tube voltmeter for measuring voltage in electronic and other low-energy circuits.

Research workers who perform calorimetric measurements at extremely low temperatures, in the region of 10° K and higher, now have at their disposal a new thimble-size platinum resistance thermometer for precise temperature detection, introduced by Leeds and Northrup Company, Philadelphia, Pa. Although only about one-eighth the size of standard high-precision platinum thermometers, it uses the same temperature-sensitive element.

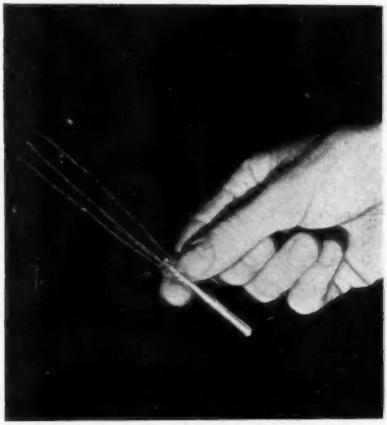
The thermometer has a platinum protecting tube, about 48 mm. long and a 5.6 mm. outside diameter, and can be readily mounted entirely inside a calorimeter by casting in low-melting alloy. It is helium-filled, and therefore usable down to approximately the boiling point of helium, about 5° K. Four-wire current and potential leads are brought out through a glass seal. Nominal resistance at 0° C. is 25.5 ohms.

Resistance Thermometry

The instrument can also be employed as a primary standard for resistance thermometry between −190 and +500°C. When used with the type 2-G Mueller bridge, temperature measurements can be made to an accuracy of + or − 0.01°C.

For studying the tiny, high speed particles that constitute beta-rays, scientists require instruments that combine precision with great facility of operation. These are some of the features which Leeds and Northrup Company says have been incorporated in the latest model of its type K potentiometer, known as the K-2. Chief features of this are the addition of a third and lower range, elimination of exposed electric conducting parts, and standardisation of the instrument on any of its three ranges (0 to 0.0161, 0 to 0.161, and 0 to 1.61 volt).

A convenient instrument to use, the last one-tenth, one-hundredth, or one-thousandth volt is spread over a 5-meter slidewire, making it a simple matter to follow a small fluctuating voltage with ease and accuracy not ordinarily possible where several switches must be manipulated within the range of the fluctuations.



Low temperature platinum resistance thermometer

The potentiometer may be used for various measurements of potential difference, for measurement of hydrogen-ion concentration, oxidation/reduction, polarisation and contact potentials. In research and industrial laboratories it is used for measurements of temperature and pH, and other potential measurements.

Recent investigations at the U.S. National Bureau of Standards of the effect of mechanical working on the physical properties of lubricating greases have led to the development of an apparatus for working the grease and measuring its flow characteristics in the same series of operations. Principal advantages of the apparatus are its flexibility, wide range of shear and consistency measurements, short test cycle, simplicity of design, and, provision for characteristic flow data while working under controlled conditions.

In addition to the application to greases, the apparatus has been used to determine the apparent viscosity of rubber solutions at different rates of shear and temperature. The worker consistometer is composed essentially of two coaxial

Apparatus for humidity regulating at temperatures below freezing point

steel cylinders mounted vertically, with a capillary-type shearing element between.

Close-fitting pistons force the grease under test through the shearing element in either direction from one cylinder to the other. While making flow measurements, dead weights are used on the down-stroke of the pistons and air pressure on the up-stroke. Provision is also made for automatic mechanical working. Possible rates of shear cover a rather wide range, from about 10 to 100,000 reciprocal seconds.

Besides its chief advantage of providing flow characteristics as the grease is being worked, the consistometer permits a complete test series at constant temperature. High rates of shear are provided by the small diameter capillary, while multi-hole discs give sufficient flexibility to cover wide ranges of rates and shear consistency. The small sample required in making a test shortens the time necessary to bring the grease to the test temperature. Simplicity of design gives facility in cleaning and charging which is significantly time saving.

New humidity test apparatus developed in the Bureau's mechanical instruments laboratory now provides workers with an instrument for research, calibration, and testing of hygrometers at temperatures below freezing. The function of the humidity test apparatus is to produce air of known relative humidity at temperatures from 0° to minus 40° C. In the new divided flow, low temperature test equipment, which was developed by Mr. Arnold Wexler, a current of dry air is divided into two streams, one of which is maintained dry, while the other is saturated with respect to ice; finally the two are recombined.

A proportioning valve is used to divide the flow of moisture-free air in a known ratio. One part is passed through a saturator over a series of trays containing ice, until it is completely saturated. It is then mixed in a mixing chamber with the other part, which has been maintained dry, and is allowed to escape through a test chamber into the atmosphere.

The saturator, mixing chamber, and test chamber are kept immersed in a constant temperature bath. The hygrometer, psychrometer, or other device, which is being subjected to air of known and constant humidity, is inserted into the test chamber. Essential functional units of the apparatus are the drying system, the proportioning system, the humidifying system, the test chamber, the cooling system, and the thermo-regulating system for temperature control.

In addition to filling a basic need in meteorology, the instrument is expected to find application in the refrigeration, air conditioning, and other fields in which humidity plays an important rôle. With the new apparatus, it is now possible to calibrate readily and accurately the various humidity instruments employed at low temperatures.

An Urgent Need

Answering the urgent need, which was particularly acute during the war, for standard samples of hydrocarbons of high purity for the calibration of spectrometers—used by the industry in the analysis of mixtures of hydrocarbons involved in the production of military aviation fuel, synthetic rubber, etc.—the National bureau of Standards has long been engaged in a programme preparing such samples and has devised special equipment to facilitate its work.

The purity of the various fractions of a hydrocarbon in preparation, as well as the final test lots, are determined from measurements of freezing points made with a precision apparatus involving a platinum resistance thermometer and bridge. The procedure utilises time-temperature observations of the liquid-solid equilibrium in freezing and melting experiments.

One of the most powerful tools for evaluation of the purity of chemical compounds is measurement of the freezing point. Two isomeric hydrocarbons having the same melting point, density, or refractive index can be mixed without signifi-

cant changes in these properties. But, if two isomeric hydrocarbons having the same freezing point are mixed, the change in freezing point will usually be very large.

Accurate measurements of the freezing points are made with special apparatus utilising time-temperature freezing and melting curves. About 5 ml. of the sample to be examined are placed in an inner vacuum flask surrounded by the refrigerant and stirred by an overhead electric motor. Observations of time and temperature are made, starting with the temperature of the liquid above the freezing point and continuing until stirring becomes difficult.

By plotting these values, using a suitable scale on the temperature axis, it is possible to determine graphically the "zero time" at which crystallisation would have begun in the absence of undercooling. The corresponding temperature value is then the true freezing point.

The calculation of purity is made from the measured freezing point as well as the value of the freezing point for zero impurity and the cryoscopic (freezing) constants. Some substances, such as ethylbenzene, do not normally yield equilibrium time-temperature freezing curves.

For these compounds, the determination of the freezing point is made from melting curves. In general, the procedure is the same as that for freezing experiments except that, when stirring becomes dfficult, the cooling bath is replaced by an appropriate warming bath.

The purifications are usually accomplished by a series of two, three, or four distillations, regular or azeotropic, at high efficiency and high reflux ratio. The blending of distillate for subsequent distillation, as well as for the final product, is normally done on the basis of the purity determined by measurement of freezing points.

Recognised as a superior means of heating liquids, permitting greater utilisation of heat generated with a minimum loss of heat, electric immersion heaters are coming into increasing use in industrial applications. In immersion heating the heat source is placed directly in the material to be heated, making liquid-heating operations more efficient and working conditions cooler and cleaner.

The most common type of immersion heater now in use consists of a helical coil of high-resistance wire stretched and centred in a seamless metal tubing insulated from the tube by an insulating material, such as magnesium-oxide powder, compressed to rock-like hardness. Protection against accidental contact of the heater terminals with liquids is provided by having the ends of the heater tightly sealed.

Similar precautions are taken against carbonaceous or chemical fumes by the

Good design is shown in this American version of the thermostatically controlled immersion heated reaction vessel

use of silicone or mycalex seals. Among the applications for which immersion heaters have been used are water, oil, electroplating baths, cleaning compounds, chemical baths, etc. These liquids can be circulating or non-circulating, and can be in open containers, closed or pressure vessels, kettles, or steam generators. Heavy, viscous liquids such as pitch, molasses, and asphalt can be heated in the same way by using a liquid jacket containing immersion heaters.

To meet the needs of the atomic energy industry, a wide variety of instruments has been developed. Not least in importance are the new miniature radiation detection instruments, small enough to be worn on the belt or carried in a pocket, and designed to protect workers handling highly radioactive materials.

Atomic Energy Protection

Two of the new instruments designed to protect atomic energy workers are "The Pocket Screamer," which rings an alarm similar to that of an alarm clock when the worker has exceeded his daily radiation tolerance, and "The Gamma Pocket Audio Detector," which registers the presence of gamma radiation (X-rays) by a buzzing sound in an ear-plug like that worn with an ordinary hearing aid.

Expected to find wide application for adjusting and testing equipment used for heating, ventilating and air conditioning, a new three-way air meter, called the "Anemotherm," providing air velocity, air temperature and static pressure readings at the turn of a knob, has recently been developed by the Anemostat Corporation of America, New York. Operating on self-contained batteries, the new instrument, weighing only 11 lb., is portable, and the small probe, attached to a long flexible cable, permits the taking of readings anywhere, even in the neck of an air diffuser.

The new meter measures air velocity in a wider range than hitherto possible, from 10 fpm to 5000 fpm, and provides rapid-response measurement of temperatures from 30° F. to 155° F. Either negative or positive static pressure may be read directly in inches of water, from .05 to 10 positive, and .05 to 4 negative. The new instrument detects even the slightest draughts and measures air velocity accurately regardless of direction of air flow.

Capable of measuring the amount of light from a candle five miles distant, a photo-electric recording Raman spectrograph, one of the few in commercial use, has been put to use analysing petroleum products in the research section of the laboratories of the Standard Oil Development Company, the research affiliate of the Standard Oil Company (New Jersey), at Linden, N.J.

Designed and constructed by chemists and engineers of the Esso Laboratories, in co-operation with instrument companies and university laboratories, the instrument is based on discoveries first made in 1928 by Sir Chandra Sekhara Raman, the Hindu physicist and Nobel Prize winner. The Raman spectrometer measures light scattered by the molecules in petroleum products, amplifies the light signal and records the analysis.

U.S. SYNTHETIC FUELS

Importance of By-Product Chemicals

THE possibility that by-product chemicals obtained in producing liquid fuels from coal may become one of the more important sources of basic ingredients for the manufacture of plastics, resins, lacquers, pharmaceuticals, solvents and explosives, is cited in a new report just released by the U.S. Bureau of Mines.

Although the primary objective in the use of the Bergius (hydrogenation of coal) and Fischer-Tropsch (gas synthesis) processes in the United States will be the conversion of coal into liquid fuels to insure an adequate supply of oil and petroleum, the report, reviewing work done so far, recognises that both the primary yield and by-products are rich sources of organic chemicals.

Cellulose Plastics

Among the by-products of the Fischer-Tropsch synthesis are water-soluble organic chemicals for cellulose plastics and fibres, acetate rayon, pharmaceutical and aliphatic industries, as well as wax and alcohols. From the Bergius process, plastics and tar bases for pharmaceuticals may be obtained, in addition to benzene, toluene and xylene for explosives and solvents. These, and other by-products, according to the report, "will be available in sufficiently large quantities to have a tremendous economic effect upon established sources and uses,"—when commercial synthetic fuel plants are operating.

The publication describes the Fischer-Tropsch and related processes and discusses primary and secondary products and their uses. It also reviews the Bureau of Mines work on the hydrogenation of typical U.S. coals, including a description of assay procedure, and summarises the results obtained during the hydrogenation of Pittsburgh-seam (Bruceton) coal under various conditions in Bureau of Mines pilot plants.

AMERICAN CHEMICAL NOTEBOOK

* * * * * From OUR NEW YORK CORRESPONDENT

CLAIMING that monopoly and restraint of trade in the vanadium industry was responsible for driving it out of business, the Continental Ore Company in a civil damage suit filed in the U.S. District Court, San Francisco, California, is seeking treble damages—$1,584,000—from the Union Carbide and Carbon Corporation, its subsidiaries and the Vanadium Corporation of America. The Continental Ore Company, alleging that the defendants now control 95 per cent of crude ore deposits and 100 per cent of distribution of ferro-vanadium, is also seeking a court order to break up the alleged " combination and conspiracy " on the ground that they represent a violation of the Sherman Anti-Trust Act. The complaint claims that the defendants refuse to sell vanadium oxide to other producers; entered into annual requirement contracts with purchasers to preclude others from securing the business; deprived other producers of a competitive market; apportioned and divided the sales of ferro-vanadium and vanadium oxide; assisted each other in controlling and dominating sales; and fixed identical prices for the sale of ferro-vanadium and vanadium oxide and for the purchase of vanadium bearing ore. The plaintiffs say they were obliged to leave the vanadium business in 1944.

* * *

Regarded as a retaliatory move against the U.S. ban on shipment of " war potential " goods to Russia, the U.S.S.R. has withheld manganese and chrome shipments to the U.S.A. in May for the second consecutive month. Both metals, essential for the production of high-grade steel, are considered so vital that the U.S. Government is buying them for stockpiling purposes. Meanwhile, it is reported that 300 tons of chrome from a new chrome mine located in the Sori area, Turkey, which may yield 40,000 tons this year, are being moved daily for shipment to the U.S.A. The new Turkish mine is said to be the richest in the world.

* * *

At June 30, this year, E. I. Du Pont de Nemours & Co., Inc., was owned by 99,663 separate stockholders, an increase of 2224 over the number reported at the end of the first quarter of the year, and 5419 more than on June 30, 1948. These significant facts are now being made known by Mr. Crawford H. Greenewalt, the company's president, who, in a letter to all stockholders has declared that the company will vigorously fight the U.S. Government's anti-trust suit instituted last week.

* * *

Clues in the elucidation of the structure of some unfamiliar fatty acids and possibly fresh light on certain forms of tuberculosis may result from current research, led by Prof. James Cason, at the University of California into the structure of phthioic acid, minute quantities of which have been isolated from tuberculosis organisms. The corrosive acid has been found to produce in laboratory animals lesions corresponding closely to those associated with tuberculosis. The Californian investigation is on lines closely similar to studies now in progress at Uppsala, Sweden.

* * *

The organisation of this year's 22nd Exposition of Chemical Industries has been planned on a scale rivalling any previous enterprise. It will be held in the Grand Central Palace, New York City, during November 28-December 3. All available space on the Palace's four floors will be required. Exhibits will be composed of raw materials, machinery and products covering every recognised industrial and commercial application of chemical materials, from medicinal preparations and foodstuffs to such things as paper, plastics, dyes, and related chemical products. The 50,000 visitors at the last of these displays, held in 1947, represented nearly 60 different industrial groups. E. R. Weidlein, director of the Mellon Institute, is chairman of the advisory committee, composed of leaders in the major fields of interest which the exhibitors represent.

South African Buchu Leaves

It has been stated that buchu leaves, a source of camphor, essential oil and resin, are bringing about £20,000 in dollars and £16,000 in sterling annually to South Africa. The Union's annual crop is estimated to be between 600 and 700 bales, of which 75 per cent is purchased by the U.S.A. and the rest by Britain. Prices have risen during the last ten years, from between 8d. and 9d. per lb. in 1938 to 3s. 6d. per lb. in 1948.

R.T.B. METHODS OF ANALYSIS. Richard Thomas and Baldwins, Ltd. 1949. London. 2 guineas. Pp. 112.

The taste for empiricism in analytical chemistry is still, unfortunately, not dead, as the present work all too obviously shows. In a prefatory note, it is stated that the object of the publication is primarily " to place on record, for the benefit of our own laboratories, the methods of analysis which are used by each section of the organisation." No originality is claimed for the methods. The note adds that in fact the origin of many of them is unknown. These points are abundantly clear when the book is read and the question is raised whether the objects could not have been achieved by some other route.

The reviewer is forced to the conclusion that each section has submitted its own rule-of-thumb methods and has rigidly persisted in their inclusion in defiance of the heterogeneity which results. This is best illustrated by example. For the determination of phosphorus by the molybdate method four procedures are given, with little or no indication as to their respective merits. After preliminary treatment, the instructions in three of these methods are as follows:—

" Method A.—Cool to 60° C., add 50 ml. ammonium nitro-molybdate solution, shake for at least two minutes and allow to settle at 50° C. for 15 minutes. Filter through pulp, washing first with cold dilute nitric acid and then with dilute potassium nitrate solution. . . . Transfer the pad and precipitate to the original beaker, add, from a burette, a measured excess of N/10 sodium hydroxide, followed by about 50 ml. water, . . . and titrate with N/10 sulphuric acid or nitric acid.

" Method B.—Add 40 ml. ammonium nitrate solution and adjust the temperature to 80° C. Add 40 ml. ammonium molybdate solution, shake for three minutes and allow to settle in a warm place for thirty minutes. Filter and complete the determination as directed in Method A.

" Method C.—Adjust the temperature to 80° C., add 50 ml. ammonium nitro-molybdate solution, shake for at least two minutes and allow to settle at 60° C. for 15 minutes. Filter through pulp and wash the beaker and pad with cold water until free from acid. Return the precipitate and pad to the original beaker, add about 100 ml. water and titrate with N/6.74 sodium hydroxide and N/6.74 sulphuric acid as described in Method A."

No reasons are given for these minor variations. In the opinion of the reviewer, no justification exists for presenting publicity this *olla podrida* without adequate theoretical backing. Even the routine assistant, if he has anything of an inquiring mind, may lose confidence in the procedure which he has been accustomed to follow, when he is presented with a range of temperatures and settling times which seem to make irrelevant all that he has been taught of rigorous adherence to analytical procedures.

The methods are arranged in four sections, dealing with ferrous metals, non-ferrous metals, raw materials and slags, and miscellaneous methods. In a book covering this range, there is a notable shortage of precise colorimetric methods, the few included either depending on matching methods in Nessler glasses, or being relegated to a quite inadequate minor section, which is difficult to track down.

Several appendices are included dealing with the physical constants of elements, strengths and equivalents of standard solutions and the like. The section on preparation of standard solutions demands comment. Standardisation of N/10 dichromate by ferrous ammonium sulphate is advocated. In the succeeding paragraph standardisation of ferrous ammonium sulphate against dichromate is the recommended procedure.

C.L.W.

RUSSIAN SCIENCE READINGS (Chemistry, Physics, Biology). L. Light, Ph.D. 1949. London: Hirshfield Brothers. Pp. 98. 7s. 6d.

This reader is claimed by the publishers to be the first of its kind. Certainly within the knowledge of the reviewer there is no other Russian reader devoted exclusively to science readings. The subject matter is, of course, elementary. It is taken from school text books on physics, chemistry and natural science but, for an introduction, this is certainly no defect. The material is exceedingly well annotated, a very necessary aid with so inflected a language as Russian and one in which idiomatic expressions are so frequent. In view of the critical interest in scientific publications in the Russian language this modest introduction will certainly serve a useful purpose.

Technical Publications

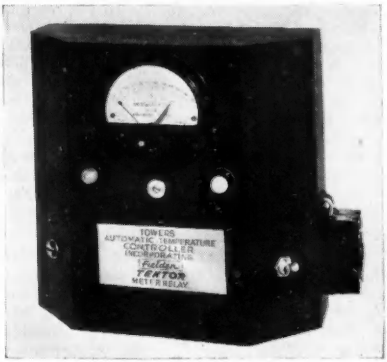
CLAIMED to be the first instrument of its kind, a new automatic temperature controller has been devised by J. W. Towers & Co., Ltd., Widnes. Based on electronic principles, the instrument is operated by a thermocouple placed inside an electric furnace and consists of a pyrometer indicator graduated in degrees C., fitted with an additional pointer which is set at the required temperature. This pointer is connected to a Fielden Tektor meter relay circuit. When the temperature indicating needle reaches it, the electrical capacity of the circuit is affected and a relay is operated, switching off the supply to the furnace. Similarly, when the temperature drops, the supply is switched on again. The accuracy of the controller, described in the company's latest pamphlet, is largely dependent upon the length of scale of the pyrometer indicator and type of furnace used.

* * *

A NEW patent (No. 2,433,989), providing a means for automatically supplying distilled water to storage batteries, has been made available for licensing or sale through the United States Patent Office by Hans J. Hansen, 343 North Lorel Avenue, Chicago, Illinois. It concerns an automatic filling device for replenishing distilled water to storage batteries to maintain the battery grids submerged in the electrolyte at all times. The device, in a transparent container, employs an automatic valve which opens to establish water passage to the cells and closes when the cells are filled.

* * *

RECENT technical papers abstracted in the June issue of *The Nickel Bulletin*, published by the Mond Nickel Co., Ltd., include L. S. Fulton's "Forging Alloys for High Temperature Service," of special interest in view of its bearing on the construction of gas turbines. The issue (22, 6), also contains reference to the first report in a series covering an investigation of the factors governing notch toughness in ferritic materials. This instalment deals with the effect of grain size. "Nickel Alloys v. Hydrochloric Acid," the concluding item in a symposium in Corrosion Forum, is another subject of special interest. The 76th Annual Mint Report, containing references to nickel and cupro-nickel coinage, is briefly reviewed.



The Towers electronic automatic temperature controller, used normally as a wall fitting in an enamelled metal case with short cable connections to the furnace

TEN years of co-operative research have gone into the production of the British Colour Council's dictionary of colours. The work, which is in three volumes, lists 378 authenticated colours, with a note of their history.

Electrochemical Research

THE Government of India has deputed an Indian scientist, Dr. B. K. Ramprasad, to proceed shortly to Japan to purchase equipment for the proposed electrochemical research institute, at Karaikudi in South India, one of the eleven national laboratories which are being set up by the Indian Council of Scientific and Industrial Research.

Indian Trade and Industry reports that the institute is the first of its kind in India to be on the lines of the electro-chemical research institute in Berlin and those in the U.S.A. At the outset it will have two main divisions—electrolytic and electrothermic. In addition there will be auxiliary laboratories and workshops and analytical and chemical engineering sections.

Investigations will cover problems relating to a variety of subjects like production of heavy water, other inorganic substances and organic chemicals by electrochemical methods, electrodeposition, electrometallurgy, electrolysis of salts.

PERSONAL

A JOINT committee of the Royal Society and the Armourers' and Brasiers' Company has appointed MR. ROBERT WILLIAM KERR HONEYCOMBE, of the Cavendish Laborator, Cambridge, to the Armourers' and Brasiers' Research Fellowship for two years from October 1, 1949. The appointment is renewable year by year for a further three years. Mr. Honeycombe will work on the inhomogeneity of plastic deformation in metals, and the influence of these inhomogeneities on recrystallisation and recovery.

SIR HAROLD HARTLEY, F.R.S., chairman of the British National Committee and International Executive Council of the World Power Conference, has been named as chairman of the Electricity Supply Research Council, set up by the British Electricity Authority. Other members who have accepted invitations to serve are: SIR EDWARD APPLETON, F.R.S., PROF. F. E. SIMON, F.R.S., SIR DAVID BRUNT, F.R.S., PROF. H. W. MELVILLE, F.R.S., SIR GEOFFREY TAYLOR, F.R.S., MR. V. A. PASK, and MR. C. W. MARSHALL. Additional nominations will be made to represent the Electricity Boards.

Among those on whom the degree of Ph.D. were conferred at the University of Aberdeen recently was MR. J. D. BURNETT for a thesis on "The Photopolymerisation of Vinylidene Chloride"; MR. A. J. R. MURRAY: "The Ultrasonic Degradation of High Polymers"; and MR. L. MACK. VALENTINE: "The Mechanism of Co-polymerisation Reactions."

SIR JOHN COCKCROFT, director of Research, Atomic Energy Research Establishment, Harwell, is to visit South Africa next month. It is thought that he will advise on the possibilities of establishing an atomic research commission in the Union to work in conjunction with the British organisation at Harwell.

SIR C. V. RAMAN, head of the Institute of Physics, Indian Institute of Science, Bangalore, has been elected a foreign associate of the Paris Academy of Sciences in succession to the late Prof. G. H. Hardy.

SIR ROLAND NUGENT, Minister in the Senate, has been appointed by the Minister of Commerce, Northern Ireland, to be chairman of the Council of Scientific Research and Development in succession to Sir David Lindsay Keir.

MR. ALEXANDER OGILVIE, of Aberdeen, now a consultant with the Sturtevant Engineering Co., London, has returned from a visit to Australasia where he is to take part in large-scale aerial fertilisation of hill country with granular material. Mr. Ogilvie was trained with Barry, Henry and Cook, Ltd., Aberdeen, and has specialised for the past 30 years in chemical fertilisation techniques. It is intended to use granular fertilisers in the aerial projects which he surveyed during this visit.

The managers of the Royal Institution have awarded the Actonian Prize for 1949 of 100 guineas to SIR ALEXANDER FLEMING, for his 1945 paper, "Penicillin—Its Discovery, Development and Uses in the Field of Medicine and Surgery." The prize has been awarded every seventh year since 1938 under a trust established in that year by the late Mrs. Hannah Acton.

MR. MORLEY T. PARRY, chief sanitary inspector to the County Borough of Northampton, has been appointed Food Hygiene Advisory Officer from August 3. He will operate from the Ministry of Food and will advise local authorities on their food hygiene problems.

LORD BOYD ORR was last week presented with the Harben Medal for "eminent services rendered to the public health," at the meeting of the Royal Institute of Public Health and Hygiene.

Wills

MR. JAMES WOODHEAD, retired manufacturing chemist, late of Godfrey Woodhead & Son, Ltd., Britannia Chemical Works, Slaithwaite, left £32,917.

MR. MATTHEW FORREST, a former director of William Forrest & Son, Ltd., Paisley, and W. C. Hodkinson, Ltd., Glasgow, left £33,439.

MR. GEORGE DALE, of Warrington, formerly for over 35 years technical manager of the fuel department of Joseph Crosfield & Sons, Ltd., left £1470.

MR. HERBERT WAREING, of Chorley New Road, Lostock, Bolton, manufacturing chemist, left £24,918 (£23,680 net).

Obituary

The death has occurred of MR. HARRY COLLINSON, 47, a plant engineer of the staff of Brookhirst Electrical Swithgear, Ltd., Chester.

HOME

Purchase Tax Remitted

Scientific instrument cases are included among the categories now made exempt from Purchase Tax as from July 25 by a new ruling of the Treasury, "Purchase Tax (No. 2) Order, 1949."

Scholarships for Research

The trustees of the Courtaulds Scientific and Educational Trust Fund have awarded post graduate research scholarships in a branch of science related to the textile, plastics or other allied industries to C. T. Greenwood and I. A. Wilkinson, both of Birmingham University.

Amino Acids Symposium

A four-day symposium on amino acids and protein hydrolysates will be held in London from September 28-30 by the Food Group of the Society of Chemical Industry. The opening address will be given by Prof. E. C. Dodds and meetings will be held in the William Beveridge Hall, Senate House, London University.

PLA Entertains Publishing Staffs

On the day following the settlement of the dock strike (July 23) some of the editorial and advertising staffs of the Benn group of trade journals, which includes THE CHEMICAL AGE, were the guests of the Port of London Authority on the s.y. *St. Katherine*, in a tour of the Royal docks. An interesting commentary on the features of the River docks and ships was given by Mr. E. T. Malone, of the PLA Information Department, and Admiral Sir Alan Geoffrey Hotham, a member of the PLA Board, also explained and commented upon various aspects of the Port services.

Petrochemicals Plant Nears Completion

Less than three years after construction began, the petroleum plant for Petrochemicals, Ltd., at Partington, Cheshire, is nearly completed. It should be finished by the end of the year, and will be supplemented later by an oil refinery with a capacity for 1500 tons. That is planned for 1951. The scheme is capable of effecting economies equivalent to $8 million a year in its initial stages. The immediate production programme embraces the manufacture of over 60 intermediates for the textile, pharmaceutical, paint, rubber, printing ink, and other industries. Some of the chemicals will be marketed here for the first time on a commercial scale.

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Cement Industry Holidays

Workers in the cement-making industry are to get a second week's holiday with pay, beginning in 1950, under an award of the National Arbitration Tribunal.

Coal Output

Last week's total coal production in Britain was 527,900 tons less than in the previous week, due to holidays. Comparative figures are:—Last week: 3,657,800 tons (deep-mined 3,442,300 tons, opencast 215,500 tons); previous week: 4,185,700 tons (deep-mined 3,891,900 tons, opencast 293,800 tons).

Scottish Bulk Oil Store?

The Anglo-Iranian Oil Company and Scottish Oils, Ltd., are mentioned as being interested in negotiations said to be in progress aimed at providing bulk oil storage in the Firth of Clyde area. Such a scheme would cost about £1.5 million and would make use of a deep water loch, serving as a bulk store for the refineries at Grangemouth, to which there would be a pipe line.

Mining Explosives

The Ardeer factory of I.C.I., Ltd., at Stevenston, Ayrshire, was visited last week by 60 delegates and members of the Fourth Empire Mining and Metallurgical Congress. The visitors were particularly interested in the section for testing explosives before they are sent out for use in coal mines and mining generally.

New Medical Film

THE British Medical Association with the support of Glaxo Laboratories, Ltd., is to produce a film on "The Treatment of Infections of the Fingers and Hands," which, it is hoped, will contribute towards greater efficiency in industry. The hand is most vulnerable to minor injury and accounts for a good deal of wasted man-hours.

The film will provide a record of the latest technique available for dealing with such conditions as poisoned fingers, whitlows, abscesses, infections of the nail-bed, and so on. Primarily intended for the practising doctor, whether specialist or general practitioner, it will also be valuable in the training of medical students.

The Hand Clinic of University College Hospital, London, is preparing the film, with Mr. A. G. Riddell as clinician in charge. It is likely to be distributed in February next year.

OVERSEAS

Fewer Refractory Bricks

High cost of fuel and labour has enforced a large reduction in Italy's output of solid refractory bricks. Production dropped 20 per cent in 1948.

Lever Bros. Expanding in U.S.A.

Work has begun at Los Angeles on a $25 million (£6.25 million) soap and food products factory for Lever Brothers as part of the company's $55 million expansion programme.

U.S. Refinery Fire

A series of explosions and a fire which swept through the Standard Oil refinery in South-East Baltimore on July 21 were reported to have injured at least 22 people, six of them seriously. Flames leaped 300 feet over the buildings as two big fuel stills exploded.

U.S. Aluminium Output

Production of primary aluminium in the U.S.A. in April totalled 540,076 short tons. This was about 1 per cent less than the figure for March because of the shorter month, but average daily output was the highest level since August, 1944. Month-end stocks at reduction plants on April 30 remained practically unchanged with a total of 11,746 short tons.

Industrial Alcohol Losses

The decline in the market values of molasses and industrial alcohol, which necessitated a write-down of raw materials and finished stocks, is reported to be the cause of the loss shown by the Canadian Industrial Alcohol Co. in the three months ended May 31, 1949. The net loss was $85,418 compared with a net profit of $410,482 for the same period in 1948.

Sweden's ECA Purchases

Some indication of the proportional import requirements of Sweden in relation to purchasing licences granted by ECA, Washington, is given by a recent announcement of the ECA delegation in Stockholm. This states that three-fifths ($24.6 million) or the $41,495,000 allocated since the commencement of Marshall Aid has been used to buy oil and petroleum products. Other purchases are: machinery $5 million, chemicals $2.1 million, iron and steel products $1.9 million, metals other than iron $1.4 million, and vehicles and spare parts $1.2 million.

U.S. Seeks Uranium Agreement

Renewal of the agreement with Belgium and Britain is sought by the U.S. Government to continue buying uranium ore from the Belgian Congo, according to a *Reuter* report. The present agreement between the three countries was made in 1944 and expires this year.

Use of Asphalt Compulsory

Alarmed by spreading use of bitumen of petroleum origin for road surfacing in Sicily, the Government of this region has approved a law whereby all roads in Sicily are to have an asphalt surfacing within 10 years. This measure has been dictated by the desire to protect the asphalt production at Ragusa.

Canadian Undertaking Sold

Light Alloys, Ltd., Renfrew, Ontario, an industry which has been engaged in manufacturing magnesium castings for British and Canadian jet propulsion engines since 1946, has been sold to Dominion Magnesium, Ltd., of Toronto. The plant has employed 150 men and lately added new equipment for sand casting costing $250,000. Dominion Magnesium has applied for authority from the Atomic Energy Control Board to use its laboratories for the assaying of radioactive ores. There is a heavy flow of ore for assay to the Ontario Department of Mines and the Dominion Government, with a resultant delay in report for prospectors.

Ammonia in Norway

A NEW Norwegian ammonia plant, a unit of Norsk Hydro, will be put into production this month in Glomfjord, north of the arctic circle in Norway. The plant will be operating at full capacity by 1950, producing 150 tons of liquid ammonia daily. The output will be transported to Norsk Hydro's saltpetre works at Heroya by three new specially constructed tankers. There it will be reprocessed for use in a variety of chemical products. Nitrogen products are an important classification in Norway's export list.

The company's saltpetre plant at Heroya is being expanded to afford a 50 per cent increase in output by 1950. The 150-ton daily capacity of the Glomfjord ammonia plant corresponds to about 250,000 tons of lime saltpetre per year.

SCOTTISH PLANT AND CHEMICALS

Wide Range of the September Exhibition

THE chemical and allied industries will be well represented among the 320 firms which will be occupying stands at the Scottish Industries Exhibition to be held at Kelvin Hall, Glasgow, from September 1-17.

Imperial Chemical Industries, Ltd., will concentrate mainly in making known the work of the Nobel division, showing explosive and non-explosive products, but will also show dyestuffs and pharmaceuticals from its Grangemouth plant.

The wetting agent and detergent, Iranopol, derived from petroleum will be one of the main features of Irano Products, Ltd., a subsidiary of Anglo-Iranian Co., Ltd.

Products from one of the most modern factories in the United Kingdom, recently established in Scotland, will be exhibited by Boots Pure Drug Co., Ltd.

Tubocurarine chlorine, processed from the Indian poison curare, now being used to cause muscular relaxation and to control convulsions and paralysis is being shown by Duncan, Flockhart & Co., Ltd., Glasgow. This firm prepared the chloroform first used by Sir James Y. Simpson in 1847, who pioneered its anæsthetic uses.

The Distillers Co., Ltd., includes in the industrial products to be represented at Glasgow, acetone, butyl, alcohol, acetic acid, acetic anhydride; methylated spirit, carbon dioxide (liquid and solid), ethyl alcohol, penicillin, and a wide range of raw materials for the plastics industry.

Electric and industrial heaters for heating water, oils, acids, alkalis, etc., are among the exhibits of Low, Duncan, Ltd.

Samples of the uses of hard chrome and the uses of electro-deposited finishes including zinc cadmium, tin, silver, gold, rhodium, etc., will be demonstrated by Electro Platers, Ltd., Glasgow.

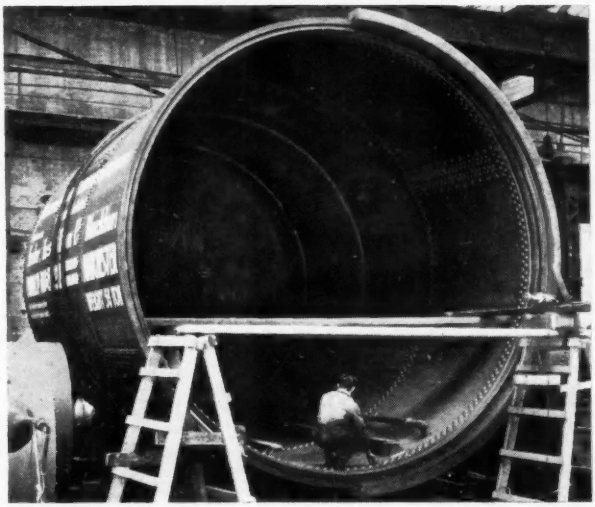
J. R. Mckellar (Alloys), Ltd., Glasgow, will be showing castings in gun metal, phosphor bronze, nickel alloys, etc., for high duty uses.

White lead and lead oxides and a wide range of paints, colours, varnishes, sheet lead and lead pipe will be displayed by Alexander Ferguson & Co., Ltd., Glasgow.

Plastics will be represented by two firms. Aeroplastics, Ltd., whose factory is equipped with compression transfer side-arm and injection moulding presses and Aeroplast, Ltd., fabricators and mouders of thermoplastic sheet.

High grade precision instruments, high vacuum plant for metallic films on glass and other scientific instruments will be featured by Barr & Stroud, Ltd.

Outsize Vulcaniser



This curing pan, the largest ever made in Britain, was recently installed in the Dunlop Rubber Company's factory at Cambridge Street, Manchester. Manufactured by Foster, Yates and Thom, Ltd., Blackburn, its weight is 58 tons, the door crescent alone weighing 13 tons. Over 26 ft. long, it has an inside diameter of 15 ft. The pan will be used for vulcanising rubber-lined tanks and similar vessels, largely for chemical processing

Chemical and Allied Stocks and Shares

HOLIDAY factors have further reduced stock market business and prices in most sections showed small irregular movements, although sentiment was helped by somewhat firmer conditions in British Funds. In the prevailing view, markets are likely to remain inactive until the autumn. It is felt that if there is not a reversal of the downward trend in exports to the U.S.A. in the next three months more drastic cuts in our imports may be inevitable. Devaluation of sterling would be accepted only as a last resort.

Markets seem, nevertheless, to be following the line that it is wise to be prepared for the worst. Speculative interest significantly tends to centre on gold mining and similar shares. Shares of companies which have important U.S. interests or which are big exporters to America also remain in favour. Otherwise, markets for the time being are moving fairly closely with British Funds, which appear to fluctuate rather sharply on moderate buying or selling.

Leading chemical and kindred shares were moderately lower on balance. Imperial Chemical at 43s. 4½d., but Monsanto have kept steady at 51s. 3d., and United Molasses have remained firm at 39s. 3d. Brotherton 10s. shares were again 20s., with Albright & Wilson 27s. 9d., Amber Chemical 2s. shares 5s., Boake Roberts 30s., and F. W. Berk 2s. 6d. shares 13s. Laporte Chemicals 5s. shares held their rise to 21s., Fisons were 44s., and British Glues & Chemicals 4s. shares have been firm at 18s. 9d. The latter company is among those which the market believes are in a position to distribute a share bonus.

Shares of companies with plastics and kindred activities have been inclined to attract more attention. De La Rue, with a rise to 29s., were good on the financial results and maintained 50 per cent dividend on these 5s. shares. British Industrial Plastics 2s. shares were 4s. 10½d., British Xylonite 67s. 6d., and Kleemann 11s.

The 4s. units of the Distillers Co. have eased to 26s., despite the financial results and 50 per cent share bonus. Amalgamated Metal strengthened to 18s. 1½d. on further consideration of the results. Glaxo Laboratories 10s. shares strengthened to £18. This is a case where earnings on the shares are well in excess of dividends paid and reserves and financial resources are substantially more than the actual issued capital, suggesting the possibility of a bonus sooner or later. Triplex Glass 10s. shares have further strengthened to 20s. 9d. in anticipation of the financial results. Dunlop Rubber fell back sharply to 61s. 6d. on reports of increasing competition in export markets, and elsewhere, Boots Drug have come back to 48s. 6d. since publication of the report and accounts. Iron and steel shares were fairly steady. Staveley were 77s., and General Refractories 23s. 4½d. Lever & Unilever eased to 44s. 3d., the prevailing view being that the full accounts and annual statement give little ground for hopes of a higher dividend in the future. Lever N.V. shares were also 44s. 3d. Oils have been firmer, although Ultramar fluctuated sharply, awaiting the results and news of the company's capital plans.

U.K. PRODUCTS FOR ITALY

AN important outcome of the recent meeting in London of the Anglo-Italian Joint Economic Committee was the granting of licences by the Italian Government for the acceptance of United Kingdom manufactured goods on a scale considerably above the level fixed in February this year.

Quotas now agreed will cover the period January 1, 1949, to June 30, 1950. The following commodities were included in the increased quotas:—

Ball clay; optical glass unworked; laboratory and industrial glassware; graphite crucibles; plumbago and graphite products; special resistance wires and tapes; scientific instruments (other than electrical); electronic equipment; electro-medical apparatus; plastic injection moulding machinery; insecticides; prepared drugs and pharmaceutical preparations; chemicals for industrial use.

In addition, the Italian Government decided to license the following commodities for which no quotas have previously been granted:—

Carborundum and emery for optical use; aluminium paste; X-ray apparatus and films; oxides and salts of nickel and cobalt; latex compounds.

It was also arranged by Italy to extend to certain types of industrial plant, equipment and machinery imported from the United Kingdom credit facilities similar to those at present extended to imports from the U.S.A. under the ERP system. These credits will cover goods up to a total value of £10 million.

Company News of the Week

New Registrations

Metal Chemical Treatments, Ltd.

Private company. (470,832). Capital £100. Electro-chemical engineers. Directors: W. Elles-Hill, T. O. M. Pope, A. J. Milne. Reg. office: 50 Gresham Street, E.C.2.

Sibley, Ravenscroft & Co., Ltd.

Private company. (470,880). Capital £1000. Manufacturers and moulders of thermo-plastic, thermo-setting plastic materials, plaster and light metal alloys, etc. Directors: I. L. J. Sibley, W. H. A. Ravenscroft. Solicitors: Simon Haynes & Co., Brighton, E.

Colloidal Graphite, Ltd.

Private company. (470,858). Capital £1000. Manufacturers of substances, materials and goods in which colloidal graphite is used; processors and refiners of lubricating oils, petroleum products, fuel oil, abrasives, chemicals, etc. Reg. office: 8 Southampton Row, W.C.1.

John Beith (England), Ltd.

Private company. (471,068). Capital £1000. Manufacturers of chemicals, gases, fertilisers, etc. The first directors are not named. Reg. office: 15 George Street, Mansion House, E.C.4.

Company News

W. J. Bush and Co., Ltd.

At the annual meeting of W. J. Bush & Co., Ltd., in London this week, the chairman, Dr. Percy C. C. Isherwood, said that net profit for the year amounted to £172,624, a reduction of £27,723 on the previous year's figure. The directors had decided, in view of unsettled market conditions, to place £100,000 to stock-in-trade reserve, and a further sum of £20,000 had been provided for deferred repairs. A final dividend of 8 per cent on the ordinary shares (total 12 per cent) and a bonus of 6d. per share were approved.

The Distillers Co., Ltd.

The consolidated manufacturing and trading profits of The Distillers Co., Ltd., and its subsidiaries for the year ended March 31, 1949, amounted to £10,361,857 (£11,182,411). After crediting income from investments £725,629 (£841,653) and over-provision for taxation, and charging depreciation £507,095 (£476,527), other provisions, income tax £3,787,470 (£3,999,190), and profits tax £1,692,469 (£2,021,959), there remains £5,130,597 (£5,676,078). The proportion of this profit to be received by the Distillers Company is £3,408,851 (£3,620,833). Payment of a final dividend of 9.6d. per 4s. unit of ordinary stock (less tax) is recommended, making a distribution for the year of 1/1.2d. per unit. £1,001,889 is carried forward, as against £887,051 brought in. The board is to recommend an increase of the authorised capital from £20 million to £35 million; and the capitalisation from the company's reserves of £7,512,923 to allot to the ordinary shareholders one new ordinary share of £1, fully paid for every complete £2 stock held.

Goldthorpes (Chemists).

Working capital has been increased by the addition of £30,500 and profits before taxation were £22,842 for the year ending March last. Dividend of 25 per cent was proposed.

Lever Bros. & Unilever, N.V.

An expansion in value of sales in 1948 was recorded with a turnover of £617.508 million compared with £479.312 million in the previous year. Consolidated net profit increased from £8,512,144 to £10,458,709. Ordinary dividend of the English company was maintained at 10 per cent and of N.V. at 8.9 per cent.

Morgan Crucible Co.

Consolidated current assets to March 31, 1949, £4,075,127 (£3,931,894). Trading profit reduced by £177,507, but an increase of £17,443 in amount available for appropriation from reservevs no longer required. The final ordinary dividend, 12 per cent, is unchanged.

Murex, Ltd.

Preliminary figures of Murex, Ltd., for the year ending April 30, 1949, show profit of £282,000 (£215,000), and taxation provision £293,000 (£220,000). The customary dividend of 20 per cent, less tax, is recommended.

International Bitumen Emulsions

The International Bitumen Emulsions report for the year ending March 31, 1949, showed a decline in profits by £29,000 to £92,000 mainly due to a smaller demand for paints. Lower tax charge, however, partly offset this effect, so that final net profit was £36,000. Dividend of 15 per cent was maintained.

Prices of British Chemical Products

Rates Easier for Several Basic Materials

CONDITIONS on the industrial chemicals market have remained practically unchanged during the past week, with a fairly satisfactory demand from home consumers continuing. Inquiries on export account are being reasonably well maintained. Among the soda products a steady demand persists for soda ash, caustic soda, bicarbonate of soda and chlorate of soda and the potash chemicals continue in good request on a firm price basis. The coal-tar products market is quiet and without special feature.

MANCHESTER.—Trade in chemical products on the Manchester market during the past week seems to have been more under the influence of seasonal conditions, although, when account is taken of this, business has been on a fair scale, especially in soda ash, caustic soda and most of the lines in regular use. Actual deliveries to the cotton and woollen industries and other leading users have been affected by holiday stoppages, but this interference will, of course, gradually become less in evidence within the next week or two. A fair amount of inquiry from shippers for a good range of products has been reported.

GLASGOW.—The Scottish chemical market is continuing very quiet during the holiday season. There are indications, however, that there may be some heavy buying during August. The demand for coal tar products continues to increase and that for formaldehyde for horticultural purposes is growing heavier.

Price Changes

Rises: White lead, magnesite, sodium sulphide.

Reductions: Acetic acid, acetic anhydride, industrial absolute alcohol, antimony oxide, bleaching powder, calcium chloride, copper sulphate, lead carbonate, lead nitrate, red lead, litharge, magnesium chloride, methylated spirit, caustic soda, sodium bicarbonate, sulphuric acid, titanium oxide, pitch.

General Chemicals

Acetic Acid.—Per ton: 80% technical, 1 ton, £61; 80% pure, 1 ton, £66; commercial glacial 1 ton £71; delivered buyers' premises in returnable barrels; in glass carboys, £7; demijohns, £11 extra.

Acetic Anhydride.—Ton lots, d¾d, £101 per ton.

Acetone.—Small lots: 5 gal. drums, £90 per ton; 10 gal. drums, £85 per ton. In 40/45 gal. drums less than 1 ton, £70 per ton; 1 to 9 tons, £69 per ton; 10 to 50 tons, £68 per ton; 50 tons and over £67 per ton.

Alcohol, Industrial Absolute.—50,000 gal. lots, d/d, 2s. 1d. per proof gallon; 5000 gal. lots, d/d, 2s. 2½d. per proof gal.

Alcohol, diacetone.—Small lots: 5 gal. drums, £133 per ton; 10 gal. drums, £128 per ton. In 40/45 gal. drums: less than 1 ton, £113 per ton; 1 to 9 tons, £112 per ton; 10 to 50 tons, £111 per ton; 50 to 100 tons, £110 per ton; 100 tons and over, £109 per ton.

Alum.—Loose lump, £17 per ton, f.o.r. MANCHESTER: Ground, £17 10s.

Aluminium Sulphate.—Ex works, £11 10s. per ton d/d. MANCHESTER: £11 10s.

Ammonia, Anhydrous.—1s. 9d. to 2s. 3d. per lb.

Ammonium Bicarbonate.—2 cwt. non-returnable drums; 1 ton lots £40 per ton.

Ammonium Carbonate.—1 ton lots: MANCHESTER: Powder, £52 d/d.

Ammonium Chloride. — Grey galvanising, £22 10s. per ton, in casks, ex wharf. Fine white 98%, £21 to £25 per ton. See also Salammoniac.

Ammonium Nitrate.—D/d, £18 to £20 per ton.

Ammonium Persulphate.—MANCHESTER: £5 per cwt. d/d.

Ammonium Phosphate.—Mono- and di-, ton lots, d/d, £78 and £76 10s. per ton.

Amyl Acetate.—In 10-ton lots, £171 10s. per ton.

Antimony Oxide.—£140 per ton.

Antimony Sulphide.—Golden, d/d, as to quantity, etc., 4s. to 5s. per lb.

Arsenic.—Per ton, £40 5s. to £41 5s., according to quality, ex store.

Barium Carbonate.—Precip., d/d; 2-ton lots, £25 15s. per ton, bag packing, ex works.

Barium Chloride.—£35 to £35 10s. per ton.

Barium Sulphate (Dry Blanc Fixe).—Precip., 4-ton lots, £26 10s. per ton d/d; 2-ton lots, £26 15s. per ton.

Bleaching Powder. Spot, 35/37%, £11 to £11 10s. per ton in casks (1-ton lots).

Borax.—Per ton for ton lots, in free 1-cwt. bags, carriage paid: Commercial, granulated, £27 10s.; powdered, £30 . extra fine powder, £31; B.P., crystals, £39; powdered, £39 10s.; extra fine, £40 10s. Borax glass, per ton in free 1-cwt. waterproof paper-lined bags, for home trade only, carriage paid: lump, £77; powdered, £78.

Boric Acid.—Per ton for ton lots in free 1-cwt. bags, carriage paid: Commercial, granulated, £48; crystals, £53; powdered, £51-£53; extra fine powder, £53. B.P., crystals. £61; powder, £62; extra fine, £64; anhydrous borax, dehydrated borax, £48 per ton in 140 lb. bags.

Butyl Acetate BSS.—£149 10s. per ton, in 10-ton lots.

Butyl Alcohol BSS.—£145 10s per ton, in 10-ton lots.

Calcium Bisulphide.—£6 10s. to £7 10s. per ton f.o.r. London.

Calcium Chloride.—70/72% solid, £8 per ton, in 4 ton lots.

Charcoal, Lump.—£25 per ton, ex wharf. Granulated, £30 per ton.

Chlorine, Liquid.—£28 per ton d/d in 16/17-cwt. drums (3-drum lots).

Chrometan.—Crystals, 5⅝d. per lb.

Chromic Acid.—1s. 10d. to 1s. 11d. per lb., less 2½%, d/d U.K.

Citric Acid.—Controlled prices per lb., d/d buyers' premises. For 5 cwt. or over, anhydrous, 1s. 6¾d., other, 1s. 5.; 1 to 5 cwt., anhydrous, 1s. 9d., other, 1s. 7d. Higher prices for smaller quantities.

Cobalt Oxide.—Black, delivered, 7s. 7½d. per lb.

Copper Carbonate.—MANCHESTER: 1s. 6d. per lb.

Copper Chloride.—(53 per cent), d/d, 1s. 9d. per lb.

Copper Oxide. — Black, powdered, about 1s. 4½d. per lb.

Copper Nitrate.—(53 per cent), d/d, 1s. 7d. per lb.

Copper Sulphate.—£36 5s. per ton f.o.b., less 2%, in 2-cwt. bags.

Cream of Tartar.—100%, per cwt., about £7 8s. per 1-2 cwt. lot, d/d.

Ethyl Acetate.—10 tons and upwards, d/d, £103 10s. per ton.

Formaldehyde.—£31 per ton in casks, according to quantity, d/d. MANCHESTER: £32.

Formic Acid.—85%, £64 per ton for ton lots, carriage paid. 90%, £67 5s. per ton.

Glycerine.—Chemically pure, double distilled 1260 s.g. £123 per cwt. Refined pale straw industrial, 5s. per cwt. less than chemically pure.

Hexamine.—Technical grade for commercial purposes, about 1s. 4d. per lb.; free-running crystals are quoted at 2s. 1d. to 2s. 3d. per lb.; carriage paid for bulk lots.

Hydrochloric Acid.—Spot, 7s. 6d to 8s 9d. per carboy d/d, according to purity, strength and locality.

Hydrofluoric Acid.—59/60%, about 1s. to 1s. 2d. per lb.

Hydrogen Peroxide.—1s. 0½d. per lb. d/d, carboys extra and returnable.

Iodine.—Resublimed B.P., 10s. 4d. to 14s. 6d. per lb., according to quantity.

Iron Sulphate.—F.o.r. works, £3 15s. to £4 per ton.

Lactic Acid.—Pale, tech., £80 per ton; dark tech., £70 per ton ex works; barrels returnable.

Lead Acetate.—White, 120s. to 122s. per cwt

Lead Carbonate.—British dry, ton lots, d/d. £109 10s.

Lead Nitrate.—About £116 per ton d/d in casks. MANCHESTER: £93.

Lead, Red.—Basic prices per ton: Genuine dry red lead, £99; orange lead, £111. Ground in oil: red, £123 orange, £135. Ready-mixed lead paint: red, lots of 20 gals. and under 160 gals. in 1 gal. tins uncrated, £2 3s. per gal.; orange, 3s. 6d. per gal. extra over the price for red.

Lead, White.—Dry English, in 8-cwt. casks, £109 10s. per ton. Ground in oil, English, under two tons, £130.

Lime Acetate.—Brown, ton lots, d/d, £18 to £20 per ton; grey, 80-82 per cent, ton lots, d/d, £22 to £25 per ton.

Litharge.—£99 per ton.

Lithium Carbonate.—7s. 9d. per lb. net.

Magnesite.—Calcined, in bags, ex works, £27.

Magnesium Carbonate.—Light, commercial, d/d, £70 per ton.

Magnesium Chloride.—Solid (ex wharf), £20 to £25 per ton.

Magnesium Oxide.—Light, commercial, d/d, £160 per ton.

Magnesium Sulphate.—£12 to £14 per ton.

Mercuric Chloride.—Per lb., lump, 7s. 4d.; smaller quantities dearer.

Mercurous Chloride.—8s. to 9s. per lb., according to quantity.

Mercury Sulphide, Red.—Per lb., from 10s. 3d. for ton lots and over to 10s. 7d. for lots of 7 to under 30 lb.

Methanol.—Pure synthetic, d/d, £28 to £38 per ton.

Methylated Spirit.—Industrial 66° O.P. 100 gals., 3s. 7½d. per gal.; pyridinised 64° O.P. 100 gal., 3s. 8½d. per gal.

Nickel Sulphate.—F.o.r. works, 3s. 4d. per lb.

Nitric Acid.—£24 to £26 per ton, ex works.

Oxalic Acid.—£128 to £133 per ton packed in free 5-cwt. casks.

Paraffin Wax.—Nominal.

Phosphoric Acid.—Technical (S.G. 1.500), ton lots, carriage paid, £61 per ton; B.P. (S.G.1.750), ton lots, carriage paid, 1s. 1d. per lb.

Phosphorus.—Red, 3s. per lb. d/d; yellow, 1s. 10d. per lb. d/d.

Potash, Caustic.—Solid, £65 10s. per ton for 1-ton lots; flake, £76 per ton for 1-ton lots. Liquid, d/d, nominal.

Potassium Bichromate. — Crystals and granular, 9⅝d. per lb.; ground, 10⅝d. per lb., for not less than 6 cwt.; 1-cwt. lots, ½d. per lb. extra.

Potassium Carbonate.—Calcined, 98/100%, £64 per ton for 1-ton lots, ex store; hydrated, £58 for 1-ton lots.

Potassium Chlorate.—Imported powder and crystals, nominal.

Potassium Chloride.—Industrial, 96 per cent, 6-ton lots, £16.10 per ton.

Potassium Iodide.—B.P., 11s. 1d. to 12s. per lb., according to quantity.

Potassium Nitrate.—Small granular crystals, 76s. per cwt. ex store, according to quantity.

Potassium Permanganate.—B.P., 1s. 7½d. per lb. for 1-cwt. lots; for 3 cwt. and upwards, 1s. 6d. per lb.; technical, £7 9s. 6d. to £8 3s. 0d. per cwt.; according to quantity d/d.

Potassium Prussiate.—Yellow, nominal.

Salammoniac.—First lump, spot, £48 per ton; dog-tooth crystals, £50 per ton; medium, £48 10s. per ton; fine white crystals, £21 to £25 per ton, in casks, ex store.

Salicylic Acid.—MANCHESTER: 1s. 11d. to 3s per lb. d/d.

Soda Ash.—58° ex depôt or d/d, London station, £7 12s. 6d. to £8 7s. 6d. per ton.

Soda, Caustic. — Solid 76/77%; spot, £18 4s. per ton d/d.

Sodium Acetate.—£41-£55 per ton.

Sodium Bicarbonate.—Refined, spot, £11 per ton, in bags.

Sodium Bichromate.—Crystals, cake and powder, 8d. per lb.; anhydrous, 7½d. per lb., net, d/d U.K. in 7-8 cwt. casks.

Sodium Bisulphite. — Powder, 60/62%, £28 7s. 6d. per ton d/d in 2 ton lots for home trade.

Sodium Carbonate Monohydrate.—£25 per ton d/d in minimum ton lots in 2-cwt. free bags.

Sodium Chlorate.—£52 to £57 per ton.

Sodium Cyanide.—100 per cent basis, 8d. to 9d. per lb.

Sodium Fluoride.—D/d, £4 10s. per cwt.

Sodium Hyposulphite.—Pea crystals 22s. 6d. per cwt. (2-ton lots); commercial, 1-ton lots, £16 per ton carriage paid. Packing free.

Sodium Iodide.—B.P., 10s. 2d. per lb. to 12s. 1d. according to quantity.

Sodium Metaphosphate (Calgon).—Flaked, loose in metal drums, £103 ton.

Sodium Metasilicate.—£19 to £19 5s. per ton, d/d U.K. in ton lots.

Sodium Nitrate.—Chilean Industrial, 97-98 per cent, 6-ton lots, d/d station, £20 10s. per ton.

Sodium Nitrite.—£29 10s. per ton.

Sodium Percarbonate.—12½% available oxygen, £7 per cwt. in 1-cwt. drums.

Sodium Phosphate.—Di-sodium, £32 10s. per ton d/d for ton lots. Tri-sodium, £62 per ton d/d for ton lots.

Sodium Prussiate.—9d. to 9½d. per lb. ex store.

Sodium Silicate.—£6 to £11 per ton.

Sodium Silicofluoride.—Ex store, nominal.

Sodium Sulphate (Glauber Salt).—£8 per ton d/d.

Sodium Sulphate (Salt Cake).—Unground. £6 per ton d/d station in bulk. MANCHESTER: £6 10s. per ton d/d station.

Sodium Sulphide. — Solid, 60/62%, spot. £24 per ton, d/d, in drums; broken, £24 15s. per ton, d/d, in casks.

Sodium Sulphite.—Anhydrous, £29 10s. per ton; pea crystals, £20 10s. per ton d/d station in kegs; commercial, £12 to £14 per ton d/d station in bags.

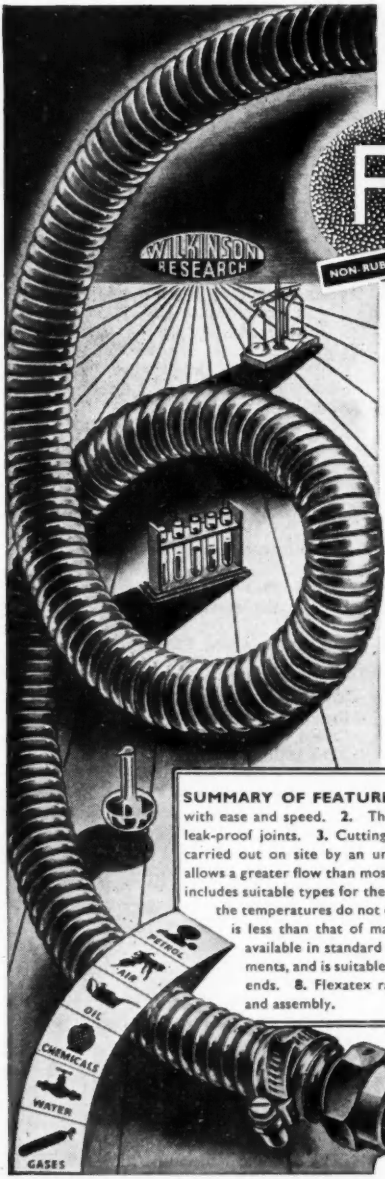
Sulphur.—Per ton for 4 tons or more, ground, £13 18s. 6d. to £16 3s. 6d., according to fineness.

Sulphuric Acid.—168° Tw., £6 2s. to £7 2s. per ton; 140° Tw., arsenic free £4 18s. 6d. per ton; 140° Tw., arsenious, £4 11s. per ton. Quotations naked at sellers' works.

Tartaric Acid.—Per cwt: 10 cwt. or more £8 10s.; 5 to 9 cwt. £8 12s.; 2 to 4 cwt. £8 14s.; 1 cwt. £8 16s.

Tin Oxide.—1-cwt. lots d/d £25 10s.

Titanium Oxide.—Comm., ton lots, d/d, (56 lb. bags) £102 per ton.



OUT OF THE
WILKINSON RESEARCH
LABORATORIES *came*

FLEXATEX
NON-RUBBER *flexible* HOSE

. . . one of the great synthetic developments during the war . . .
now making an outstanding contribution to industry.

Product of the experience and resourcefulness of the Wilkinson Research Chemists, Flexatex non-rubber flexible hose filled the gap caused by a war-time shortage of rubber . . . and it has come to stay! Constructed from materials specially selected to suit varied industrial conditions, Flexatex has proved its value in all fields of Industry. There are types of Flexatex hose suitable for a wide range of fluids and gases and for use where resistance to oil and chemicals are of paramount importance.

SUMMARY OF FEATURES. 1. End connections can be fitted to Flexatex with ease and speed. 2. The special construction of Flexatex ensures positively leak-proof joints. 3. Cutting and assembly of Flexatex and end fittings can be carried out on site by an untrained operator with ordinary tools. 4. Flexatex allows a greater flow than most flexible hoses of equal bore. 5. The Flexatex range includes suitable types for the conveyance of a wide range of fluids and gases where the temperatures do not exceed 70°C. 6. The weight per foot run of Flexatex is less than that of many types of ordinary flexible hoses. 7. Flexatex is available in standard 14' 6" lengths which can be easily cut to any requirements, and is suitable for use with standard A.G.S. parts, straight or beaded ends. 8. Flexatex rationalises the whole method of flexible hose supply and assembly.

For full details, and a comprehensive survey of the practical applications of Flexatex Hose, write for the MANUAL OF TECHNICAL DATA for FLEXATEX. Specific information will also gladly be supplied to enquirers, who should give details of fluids or gases to be conveyed.

WILKINSON RUBBER LINATEX LTD., FRIMLEY ROAD, CAMBERLEY, SURREY.
Tel.: Camberley 1595. Also in Canada, Australia, South Africa, U.S.A., Belgium, Holland, Scandinavia, Malaya, etc. Also makers of Linatex 95% Pure Natural Rubber Linatex Ball Mill and the Linatex Pump

Zinc Oxide.—Maximum prices per ton for 2-ton lots, d/d; white seal, £61 5s.; green seal, £60 5s.; red seal, £58 15s.

Zinc Sulphate.—£31 per ton.

Rubber Chemicals

Antimony Sulphide.—Golden, 4s. to 5s. per lb. Crimson, 2s. 7½d. to 3s. per lb.

Arsenic Sulphide.—Yellow, 1s. 9d. per lb.

Barytes.—Best white bleached, £8 3s. 6d. per ton.

Cadmium Sulphide.—6s. to 6s. 6d. per lb.

Carbon Bisulphide.—£37 to £41 per ton, according to quality, in free returnable drums.

Carbon Black.—6d. to 8d. per lb, according to packing.

Carbon Tetrachloride.—£56 to £59 per ton, according to quantity.

Chromium Oxide.—Green, 2s. per lb.

India-rubber Substitutes.—White, 10 5/16d. to 1s. 5¾d. per lb.; dark, 10½d. to 1s. per lb.

Lithopone.—30%, £36 15s. per ton.

Mineral Black.—£7 10s. to £10 per ton.

Mineral Rubber, "Rupron."—£20 per ton.

Sulphur Chloride.—7d. per lb.

Vegetable Lamp Black.—£49 per ton.

Vermillion.—Pale or deep, 15s. 6d. per lb. for 7-lb. lots.

Nitrogen Fertilisers

Ammonium Sulphate.—Per ton in 6-ton lots, d/d farmer's nearest station, in July, £9 17s. 6d., rising by 1s. 6d., per ton per month to March, 1950.

Compound Fertilisers.—Per ton d/d farmer's nearest station, I.C.I. No. 1 grade, where available, £10 14s. 6d. I.C.I. Special No. 1, £15 6s., rising by 2s. 6d. per ton per month to June, 1950. National No. 2 raised from £10 8s. 6d. to £10 18s. per ton, due to increase in potash content, as notified in new Board of Trade Order.

"Nitro-Chalk."—£10 4s. per ton in 6-ton lots, d/d farmer's nearest station.

Sodium Nitrate.—Chilean for 6-ton lots d/d nearest station, £11 per ton.

Coal-Tar Products

Benzol.—Per gal. ex works: 90's, 2s. 6d.; pure, 2s. 8½d.; nitration grade, 2s. 10½d.

Carbolic Acid. — Crystals, 11½d per lb. Crude, 60's, 4s. 3d. MANCHESTER: Crystals, 10¾d. to 1s. 0½d. per lb., d/d crude, 4s. 3d., naked, at works.

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p-**Cresol** 34/35° C.—Nominal.

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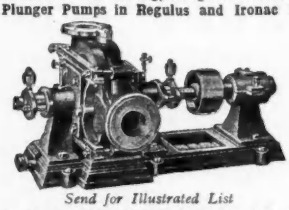
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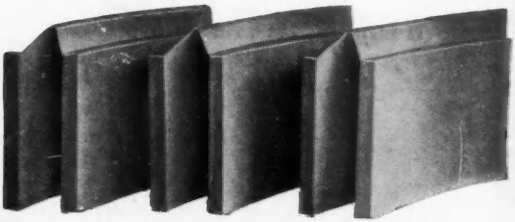

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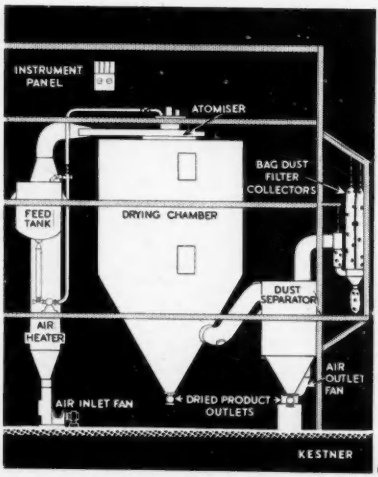

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